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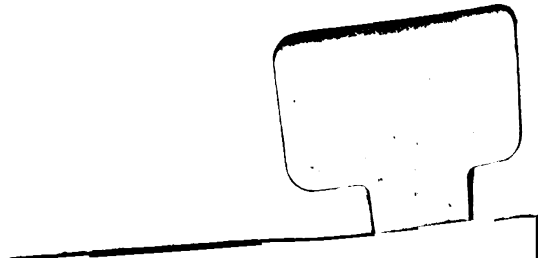

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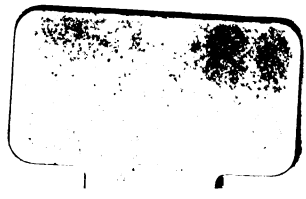

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THE ENSILAGE CONGRESS

REPORT OF PROCEEDINGS

OF THE

THIRD AND FOURTH CONGRESSES.

HOW TO BUILD SILOS—INEXPENSIVE SILOS—ANALYSES—RESULTS—COST—PHYSIOLOGICAL VALUE OF ENSILAGE—GREEN MANURING—AND UNDERGROUND IRRIGATION.

THE OBJECT OF THIS BOOK IS THE INCREASE OF THE PROSPERITY OF FARMERS.

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OXFORD.

Corn is used in this book instead of *maize*.

Chaffing is cutting stalks by cutter after having been cut down in the field.

ENSILAGE

Is the method of preserving green fodder crops in pits called silos by continuous pressure on the top, by which means the air is expelled as the material shrinks in bulk. This method was first used by Auguste Goffart in France, in 1873, when he preserved in his elliptic brick silos, partly above and partly below ground, a large crop of green corn. Mr. Francis Morris, of Maryland, adopted this method in 1876 and has ensilaged several hundred tons a year in earth trenches each year since that time. At Mr. Morris' suggestion the treatise of Goffart was translated in 1879 by J. B. Brown, President of The New York Plow Co., and a number of silos were built in 1881. The Ensilage Congress of January, 1882, gave a great impulse to the method, and at this time there are not far from a thousand silos in America and seven hundred in Great Britain. These silos are built of brick, stone, concrete, wood, and some are merely earth trenches or pits. The concrete is the best receptacle as it is more resistant to dampness and frost than the other materials. An earth trench preserves the fodder very well but there is some moldiness at the edges which may perhaps be avoided by wooden sides; at any rate it is much more profitable to begin in that way than not to begin at all. The comparative value of good ensilage over ordinary dried stalks for feeding horned animals is so great that nearly all ensiloers not only continue and enlarge their silos but become enthusiastic. At the Fourth Ensilage Congress, a farmer who had practiced it several years at Hornellsville, N. Y., and had saved in good order by ensilage a crop of corn that frost had overtaken, and who had made a profitable business out of an unprofitable one, announced himself as being "ensilage crazy." With the very few who have not continued, there is in each case some peculiar reason; some

have been discouraged by early frost, others by drought, and some have made very poor ensilage.

The most profitable crop for this purpose in the United States is corn, which requires 60 to 90 days to grow, according to the heat and moisture of the season. Twenty to thirty tons per acre is an ordinary crop of the green stalks, but much heavier crops have been grown in favorable soil. Kansas exhibited at the Centennial Exhibition stalks 30 feet high. Goffart speaks of having made in one field more than a hundred tons to the acre. The best seed for this crop is the Southern White, or Horse Tooth. This seed is grown where it has plenty of air and sunshine, a single plant in a place; and in a favorable season and good soil, it makes a great growth and very sweet juice. It should be planted as early as possible, so that it may have all the season if it needs it. It is a peculiarity of corn that it apparently knows how long a season it has, and makes its arrangements accordingly. The same seed will top out at 18 inches, or 18 feet, as it sees a chance of making an ear before frost. It seems to struggle intelligently to grow as high as it can without failing to make its seed. But there is always time to plow under a winter crop of rye, which is the best use to make of it. I would prefer to have surely one fully matured crop of Southern white corn than a crop of oats and peas sown in the spring, and a smaller or less ripened crop of quicker growing corn planted later. Corn may be grown eternally on the same field by the return of the resultant manure. Chemists say that phosphoric acid is all that is not returned, but Goffart says that two-thirds of the manure will keep up the land for the corn crop. The manure should not be charged to the crop unless it be also credited with that item. It is best to plant it in rows, 3 to 4 feet apart, and 4 to 6 inches in the row, though some plant it closer, and claim that it is easier to handle when grown thickly, and not so necessary to chaff it; but for prime quality of ensilage it needs sun and air, and very likely a foot apart in the row will make as much syrup to the acre as if planted closer.

Clover is also an excellent crop for silo but the most attractive fodder of all to horses as well as cows is oats and peas; and under favorable conditions 20 tons to the acre may be had of these. The oats hold up the peas, and they bloom about the same time. Orchard grass will sometimes make a growth of seven feet, which means at least 15 tons to the acre. A variety of food is appreciated by the cattle, and a farmer should have several silos and a supply sufficient to last him all summer, and avoid the waste of manure and land incident to pasturing. Some

very poor clover ensilage has been made in this country but the cause will be explained in the letter of Mr. G. Fry, who was the first writer to speak of "sweet ensilage."

I have never seen any corn ensilage that was sweet to the taste, but I have seen it sweet to the smell and there are many degrees of quality. It seems to be well settled that the more mature the stalk the sweeter the ensilage; but the best stage of maturity is when the ear is between the milk and the glaze. At this time the juice is sticky and at its sweetest and is distributed through the whole plant, so that the stalks, leaves and ears are all attractive to the animal. This cannot be far from being "a perfect food," and the effect upon cows and bulls is to fatten them, if they can get enough of it, and without requiring any other grain.

The question of heating in silo which was brought out at Third Congress by Prof. Miles, and which promised to give us sweet ensilage, has not kept its promise. Some farmers who have practiced slow filling, leaving silo uncovered till it reached 122 deg. and over, have had somewhat better ensilage than before, but they are not sure that it is the heating, while other farmers who have finished up the work as rapidly as possible have just as good ensilage.

It will probably be found that immature crops may do better to have some extra heating before covering, in order to evaporate or change some of the water that they contain, but the same effect may be produced, as Mr. Fry suggests, by "haying" it a little. It is very desirable, however, to know that neither great haste nor some delay will materially injure the ensilage; sometimes it is more economical to hurry up, and sometimes to work leisurely. The old bugbear of an air-tight silo being necessary has been exploded. Farmers thought a few pin-holes would spoil the crop. In France they are now stacking their hay crops direct from the swath, under pressure, with excellent results, and it is probable that farmers lose a large percentage of nutriment in making hay too dry. Perhaps the hay tedder had better go, and compression ricks and bays come in (not patented).

When partially cured by drought while standing, it is always sweeter, and need not be "hayed" or heated. The wetter the corn is at cutting, the more acid will be the ensilage.

The British farmers are enthusiastic for ensilage. At the last Smithfield Cattle Show there were 248 exhibitors of ensilage. The scientific men, including Lawes and Gilbert, have tried in vain to hold them back.

If Mr. Crozier should go home to talk roots they would think he was Rip Van Winkle.

As the discovery of sweet ensilage was made in England, it is probable that it only applies to clover and grasses. The shrinkage in silo is about one-third.

The weight upon the cover is not a very exacting matter. It may vary from 25 pounds to 500 pounds per square foot of surface. A foot of earth shovelled on the descending cover will answer every purpose. If the stalks do not contain too much water no juice will exude and if it does it will generally be re-absorbed, hence the patented pipe arrangement that wasted some time at the last Ensilage Congress excited no interest; in fact this method does not require the assistance of any inventors. It seems to have sprung full-fledged from its author's brain.

Perhaps the best use for the weight as well as for chaffing is to make the contents more solid, and to remain in better order when being used out; for in warm weather it quickly deteriorates on the face. Elder Evans says that when hemlock was used as a cover the ensilage was sound close against it, where usually is an inch or two of mold. It is not so much the pressure as the heat that causes it to shrink in the silo. In feeding ensilage the cattle will take it as they can get it, but I have found that they like it best when heated after removal from silo, and especially when mixed with the meal and put in a covered box over night; it comes out of this sweat box steaming hot and is all eaten up with avidity. There is no doubt as to the healthfulness of this food for cows and sheep and especially when it is good. It is far safer than dry grain as it never scours when it is good, and the cattle are in much better spirits than when fed on hay, but it does not take the place of a good-natured man or of a dry, healthy stable. The corn ensilage that killed Mr. Bronson's horses was immature, having been cut early when fallen; it was very sour and was fed in larger quantities than should have been given them if fresh from field.

Mr. Garrett, of North Carolina, has fed many horses and mules for years on oat and cow-pea ensilage; and undoubtedly clover and other perennial ensilage is excellent horse food, and well-matured corn stalk ensilage in moderate quantities would be perfectly safe.

The woody fibre is softened by the heat in the silo and rendered more digestible, therefore corn stalks that have been husked still have enough juice left to make good ensilage, so that the small farmer may have both the ears and the ensilage; but the northern varieties better serve this

double purpose. It is certainly a great waste to let the stalks dry hard after the corn is glazed, when silos may be so easily made.

From CHARLES W. MANN, Mass., to "Mirror and Farmer."

Plant your corn as early as the season will allow, as one day in June is often worth three in August on the growth of the crop, and a frost will do less damage in June than in September. Sow in drills, three to three and a half feet apart, not over one-half bushel of seed to the acre (let me repeat just here, never sow broadcast, nor use two or three bushels of seed to the acre, for you will repent it if you do), so that your corn may grow good size, and be well matured, and full of nutriment, not small, tough, yellow, sickly looking stuff, which will tumble down in the first heavy rain or high wind.

Cultivate your crop carefully and often, and it will need no hand hoeing, although on old ground it would pay to pull the weeds from the rows, but with a good cultivator well used, little hand work will be needed on any ground, old or new.

Having been asked by many as to the advisability of putting the rye crop into the silo the coming season, I make this statement which I think will be accepted as true by those who know. Instead of leaving your rye to put into the silo, and making your corn crop very late, as it would be June 20, before you could clear off the rye and plant corn, just plow it under by May 20, when it will be two feet high or more, putting on manure the same as in the first case; plant your corn and you will get more tons of ensilage at the one crop than you would from the two, while it will cost less and be more satisfactory in every way. A very good and cheap way to keep up the fertility of the ensilage ground, which should always be as near the silo as possible, is to sow rye just before the last cultivation of the corn, and, the next spring, plow it in before sowing the corn; then by using a good bone phosphate, ten to twenty dollars' worth to the acre, all the manurial product of the farm could be used for other crops, and the value of the silo will be still more apparent. One man with whom I am acquainted cuts his corn with his mowing machine, one row at a time, and says it is a great success; has never broken anything but a few sections, and what is that compared with the hand labor saved; his corn was large and heavy.

It is better to chaff it than to bother with packing it in whole, and cutting it down with a hay-knife or sharp ice-chisel, as some speak of; and it is cheaper and better to do so, as it will pack closer, and keep better, beside being much easier to get out and feed when you want it, and in better shape for the cattle to eat it. For large farms with large silos, plenty of men and teams, and large capital, a good steam engine, without doubt, furnishes the best power for cutting ensilage, as it works quickly, cheaply, and is always ready, but for small farms with small silos of 150 tons or less capacity, a good horse-power is better adapted to the purpose, as almost any horse will soon become used to it, and it is not as hard as some other work horses have to do.

At least ten men and two double teams are required to keep things moving if an engine is used, breaks are likely to occur which will often spoil a day's work, and if hired will cost more than a horse-power of your own, so it is generally better to have things so arranged as to be able to do the work with your own men and teams, and be independent of your neighbors, who are always busy at that season, and of extra help, which is scarce at such times.

I prefer a heavy cutter run at high speed, and kept half full of corn so as to work easily, to a small cutter crammed to its utmost capacity to get the work along fast enough, as it is much easier for men and horse, and will cost less for repairs. Four men and two horses make a good team for harvesting the crop, when using a horse power, and under ordinary circumstances will fill the silo as fast as is necessary, while two men and one horse could fill a small one, by first teaming a number of loads and dumping near the cutter, then put the horse in the mill and cut it; this would be a slow process, but practicable.

In regard to the feeding of ensilage, I have found good results from two feeds of ensilage and one light feed of Hungarian or cheap hay, together with four qts. of ground-corn and oats per cow, mixed with the ensilage; and my herd of thirteen cows have given from 80 to 100 quarts of milk a day since going into the barn.

A neighbor feeds largely to his swine, and out of 300 hogs, has not had a sick one all winter; he feeds his cows nothing but ensilage, sixty pounds each per day, and grain, and makes very nice butter for fastidious city customers; while another feeds only ensilage and grain twice a day, and carries his milk to market—some 140 quarts a day. He met a doctor the other day who was very much against ensilage, and was telling of the injurious effects of "silo milk" on young children, when he asked him to get right on to his team with him, and go round his route, and he would show him eighteen as fat, healthy babies as he ever saw, who never have had anything but "silo milk." The doctor was busy and had no time to spare for such investigations.

From WM. M. WHITE, Allegany Co., N. Y., to "Country Gentleman."

It takes 100 pounds of grass to make 25 pounds of hay; 50 pounds of ensilage gives as much nourishment as the 25 pounds of hay. We seem to lose one-half the nourishment in the grass, in curing it.

There is not to exceed ninety days of good pasturage in our whole season. The first growth of grass is immature, and lacking in nourishment; afterward come drouth, heat and dry pastures. With ensilage one cuts the food in its richest condition, and preserves it so that it is far ahead of ordinary soiling, and the testimony goes to show that ensilage seven months old is more valuable as food than that which is two months old. The small farmer of fifty acres should keep four cows and two horses. He can raise the food for them on six acres of land, and have 44 acres to cultivate for salable crops, and the four cows and the poultry will pay the store bill. Calves eat it readily, and with ensilage and a little meal it seems practical to raise grade Short-Horns, and make them weigh 1,200 pounds at two years of age. That is, we shall be able to raise stock as cheap as we can buy it, or at least that we can raise it without loss in dollars and cents, and that will be a great step in advance. For if we put market value on the food consumed we cannot raise cattle at a profit. With ensilage it can be done.

My four-year-old Devon bull, fed on ensilage and barley meal (four quarts a day), gained 100 pounds in 42 days. An old cow without front teeth, weighing 875 pounds, fed on 60 pounds of ensilage and 4 quarts of barley meal, gained 100 pounds in 40 days.

Fine grade Short-Horn steers coming two years old, have had 30 pounds of ensilage each, and the pickings of the barn-yard and nothing else. They weigh 800 pounds each, and in the last 71 days have gained 65 pounds each. Fourteen steers have been fed on ensilage for 100 days. They weighed 11,585 pounds (827½) each. They have

consumed three tons of corn meal. They now weigh 13,530, a gain per head of 139 pounds in the 100 days. But for three weeks they were fed in an open yard, without shelter. Then they were housed. They were also covered with lice when bought, and it was a very long tedious job to get rid of them. They consumed about 70 pounds of ensilage a day and had no hay, straw or cornstalks. Nor did they drink any water, and they were irregularly fed. In feeding ensilage alone, or with meal, the cattle require no water. They do not scour. The dung is neither dry nor liquid, but of a proper healthy consistency; it appeared digested and the food assimilated. There is no smell or odor perceptible in the manure.

From three pecks to six are used for drilling in. Prepare the land as for corn. Drilling in a double row, four inches apart, leaving 28 inches space between the rows, is the best way to plant it. This gives from ten to twenty tons to an acre, of valuable fodder. Broadcast corn is not nutritious, except the leaves. It is too young, and grows too closely together to make nourishing food. More weight can be grown in drills. Ensilage should not cost more than two dollars a ton, and two tons of ensilage are equal to one ton of hay. A ton a month is full feed for a cow, so that a cow can be wintered for $12. With hay at $8 a ton, it would cost $20.

I built two silos last summer under sidehill barns, one of 200 tons, one of 300 tons. I raised only 300 tons of ensilage. I shall raise more and probably build two wooden silos. If it be true that we destroy nearly half of the nutriment in grass by curing it, we are losing too much. By ensilaging we escape poor hay, and the terrors of a rainy haying-time, and have the control of harvesting the grass crop. I have not yet found the man who has tried the experiment who is willing to go back to the old way.

From JOHN WHEATON, Barre, Vt.

I had my fears at first, that the system of ensilage was not all that was claimed for it, but my observation and short experience have satisfied me that ensilage is destined to come into general use in this country where corn can be raised so much easier than any other forage crop, and yet is so difficult to dry and store away in its partially dry state. But if it is ensilaged, it can be kept so near its green state as to be made a sort of substitute for green grass.

Our old cow-pastures are failing year by year. How are we going to fertilize and improve them any easier than to feed ensilage and have the cows get part of their living from the pastures and thus become manure-carts over the hills and roughness of our pastures? Many think in this section that their old cow-pastures will not carry three-fourths of the cows they would twenty years ago. What are we coming to if it is a fact and nothing is done to improve our pastures?

It is a question with some whether to put the corn whole or cut into the silo; and with others whether to raise ensilage corn, or common field corn and pick the best ears and ensilage the rest. I am satisfied that I can fill mine the easier to put it in whole, and I can do it with my own help, at my leisure, and be independent of my neighbors. However, I think I shall put it in whole another year. I visited some silos lately, and one was filled with uncut corn fodder, and it was in a good state of preservation and the cattle ate it as readily as the cut and were in good condition. I cut and put into my silo last September the common field corn, after the best ears were picked. My cattle seem to like the ensilage from the ensilage corn the better, though the stover of the field corn had got to be somewhat dry.

I built a silo last summer, 16 by 17 and 24 feet deep, taking a bent of my barn, which had two doors, one opening into each floor, which I finished into a silo by boarding with rough boards each side of the sills and the timbers put in, and papered upon the inside of the outer wall and filled with sawdust. I dug to solid earth, and cemented to the walls. The silo cost me thirty-five dollars. I intend to sheathe the inner walls with matched boards before I fill again. My ensilage kept well and I am satisfied with it. The pressure being so great it came near bursting one door open. Wooden silos may rot out in time, but as far as I have examined the silos the ensilage will hurt more next to the stone than the wood.

The prospect is that more silos are going to be built this year in this town than during any two years before. They build them because they are open to conviction and have seen the working of the system themselves and do not believe in the theories of the anti-siloists. I had rather have the testimony of 50 head of cattle on the worth of ensilage than 1,000 anti-siloists that have no practical knowledge of ensilage.

From Capt. G. MORTON, Vermont, to "Country Gentleman."

The grass which I ensilaged in the barn silo comes out excellent; everything on the place eats it up clean, as is the case with the corn ensilage, and I think that the cows increase in milk since I commenced feeding grass once a day without grain. This grass was put into silo during wet weather, with no extra expense. True, I let it stand a week, when I was occupied hauling material for a house, and it got pretty hot (180° F.). I covered it with tarred paper, and it comes out sweet and nice. I adopted the plan from the first (now the fifth season), to fill slowly, and always had sweet ensilage; of course exposure to air sours it. What was brought out before the Ensilage Congress—to fill slowly—is what I have always practiced. In putting in cornstalks, which I have also done every year with success, I pull off the ears as soon as a little glazed, and cut the stalks in half-inch lengths, just as I do the green fodder, mixing it in the silo.

The best way I have found to use straw with ensilage, is to cut and mix in a pile, wetting it well.* It will all heat and steam in twelve hours if well wet. I mix whatever grain I feed with it. I am inclined to think that grass ensilage fed once a day, with corn ensilage twice, makes a perfect feed even for cows in milk, without grain. Hogs will eat this grass ensilage up clean. I put mine in whole, but shall never do so again, as it make a stringy mess to shake out before feeding, and it is little trouble to run it through the cutter, and then it is all prepared to feed to anything, even to fowls. I have eggs all winter now; before we had a silo we hardly had any. In the face of all these facts, people right around silos will not take the trouble to look for themselves, and say they do not believe in ensilage.

HOW ENSILAGE WAS INTRODUCED INTO ENGLAND.

We have given elaborate details from time to time in the "Guardian," of the progress of the ensilage movement, the mode of making silos which has been adopted, and the method of filling them, &c. In the immediate neighborhood of Bowdon, an experiment has been made on a small scale certainly; but with such success that it deserves to be widely known. In the summer of last year Mr. James Taylor, of Ashley Heath, made a silo or pit of a very primitive character, and "hogged" in the grass in fact.

*I would omit the wetting, and put it in a covered box to steam itself. J. B. B.

Mr. Taylor did not, in his experiment, like many others take the worst grass he could find. He put in the best, and the result has been such as to induce him to recommend the system enthusiastically to his neighbors. Samples of Mr. Taylor's ensilage were taken to Tafton Park on Tuesday, and the horses took to it like ducks do to water—some indeed ate it quite ravenously. Bowdon must not be without all the honor which is justly its due in this matter. Mr. Ellis Lever, of Culcheth Hall, a couple of years ago made a tour in the United States, and in the course of his travels obtained much valuable information. The system had been tried there with abundant success, and had awakened a national interest. On his return to this country Mr. Lever went into the matter with characteristic energy, and through the press and by means of pamphlets sent to the landowners and leading farmers, he was instrumental in drawing attention to the value of ensilage in a variable climate like that of England. On Tuesday Mr. Lever was introduced to Lord Egerton, who warmly thanked him for the interest he had manifested in the matter, and expressed himself strongly of opinion that the system would be of benefit to the nation at large. Of course there is a difference of opinion amongst farmers as to the value of the new system. Some object to the look of the stuff after it leaves the silo, others object to the cost; but taking the simple system adopted by Mr. Taylor at Ashley Heath, who will be willing to show the product to the farmers who may visit him, there need be no fear on either of these heads.

Fine corn ensilage weighs 45 pounds to the cubic foot. A bushel basketful weighs 30 pounds and is a full mess for an ordinary animal fed twice a day. Ten tons of ensilage can be put in the same space occupied by a ton of hay, and the finer it is chaffed the closer it lies and the easier it is cut or raked down and measured out and mixed with meal, and the less damage is received from exposure of the face. The silo should have a lower door which, if possible, should be on level with feeding floor, but it may also be discharged from top surface by a pulley and basket.

Much testimony goes to show that wooden silos are good, built like an ice house; but when built above ground and out-doors the ensilage is more liable to be affected by temperature than in those made of masonry, and they should have 10 inches of space between the double walls for dead air or other filling. The objection to rods and screws is that as soon as you stop tightening the nuts you take off the weight. One may depend on weights, for gravity never forgets to press. The cost of raising and ensiloing several hundred tons of ensilage need not be more than $1.00 per ton. Any excess of cost above this sum is the result of bad management or poor machinery. (See Mr. Gilbert's statement.)

The cost of a corn crop is the cost of corn ensilage. Twenty tons per acre costs but little more to raise than ten tons per acre. So the amount raised on an acre governs the cost.

From S. L. L., Va.

I have 130 ewes now lambing. I yarded them on the 15th of November and have fed them every day since on ensilage—6 lbs. corn ensilage and 1 pint mill feed being the daily ration. These ewes have not had anything but the ensilage; no straw, no hay, no fodder, and have not been out of the yards except to go to water. The sheep are in fine condition; all well, and not a single sheep but will fight for her place at the feed rack. All the lambs dropped have been strong and fat, and I have nearly one-third more lambs than mothers. None of my stock has scoured. Before feeding ensilage, I was compelled to cook the bran for my cows to prevent scouring, but since feeding ensilage I have had no trouble and do not cook the bran.

Capt. G. MORTON, of Vt., to "Country Gentleman," Oct., 1884.

ENSILAGE ON THE FRY SYSTEM.—We had heavy frosts in September, cutting corn and buckwheat badly. My corn fodder was all snugly stowed away in the silo, one great advantage we ensilagists have over the farmer who waits for corn to get ripe. As I am getting well down the shady side of life, I was intending to curtail my farming somewhat this year and take the world easy, but reading your article in June about *sweet* ensilage, I endeavored to follow the directions of Profs. Fry and Miles, and I put into my barn silo a partition, and commenced the last of June to put in grass, mixing the green oats, and continued filling during the whole of July, first one silo and then the other, keeping up the temperature to 122° Fahr. and up to 150° at times. I finished filling with corn fodder, mowed with scythes, and pitched into silo about one foot a day, as I found this quantity would keep the heat rising toward the top—no treading except about the sides. When finished, covered with two thicknesses of tarred paper—no boards or plank, and only six inches of dirt for weight. This was examined daily, to see that all was air-tight, and snugly pressed about the corners and sides to keep in the heat, which, for a week after closing, was 130° F. Now, after a month has elapsed, the thermometer has gone down to about 90°. I have sampled the ensilage and find it of a quite brown color and a sweet, honey smell, which continues for a week after being taken out. Everything was put in uncut; yet I haven't a doubt that cutting the corn fodder would have been much better; it certainly could have been run through a cutter, and, with an elevator, put on the top of a silo much easier and with less labor; and, after the heat is once started there would be no difficulty in keeping up temperature if there is no treading. There isn't a doubt in my mind that the heating process is the true one. There is absolutely no acid about it; there is saving in labor, and it does away with hurry and rush in filling. This season I have been all summer filling; hired but little extra help, and I am sure saved half the expense. I used a tube to find temperature, as Mr. Fry recommended. There is no guess-work about it, for we know if the germ is killed we are sure of good results. I consider the information given us by Messrs. Fry and Miles the most important of all that has been written on ensilage, but how strange is the prejudice that exists!

My wife's brother was at home this year after thirty years' absence, and seemed to be well pleased with the ensilage system when here, for he could see that we kept three times the stock ever kept on the old homestead in his father's life-time (his father was one of the most judicious farmers in town). He now writes me that he thinks the ensilage craze is about over; all the reason he gives for it is that he met a man whose

brother had fed more meal than was profitable, and this has been the cry about me: "The captain feeds so much grain!" They give no credit for the rich manure; all these criticisms don't have the least effect on me.

The heat in the silo is manifestly very important in the case of clover, rye, oats and grass ensilage. This heat must commence in the lower layer, of a few feet in depth, and rise through each successive layer; therefore such silos should not be filled too rapidly nor trampled before the heating occurs. But I do not think that corn ensilage will be improved by the same method as I have seen just as good ensilage that had been filled rapidly as any that has been filled slowly and I think that maize is not so much sweetened by heat as by ripeness. (See Mr. Fry's letter to Fourth Ensilage Congress.)

P. S.—Since the above was written, I have seen (February 2, 1884,) sweet corn ensilage. It was discovered in his silo by Mr. H. H. Brown, of Winterton, N. Y. It is bright, moist and *entirely free from acid flavor or odor*, and is fresh and pleasant to smell and taste. It is a layer of about two feet deep in the upper portion of the silo, whieh was permitted to remain uncovered until it was heated to 135°. The ears on the stalks were in the milk, and cut ⅜ in. This ensilage was not trampled, except that incident to levelling the surface, the object being to have it as loose as possible. The silo beneath it, filled from same field, but not permitted to heat by exposure, has the usual acid taste and penetrating odor. The cows, however, did not show any especial excitement over the discovery, and like many other things, it is probably more valuable in the chase than in the possession. Those who want sweet maize ensilage, therefore, can have it by allowing time to heat to a certain point before covering. I have from my underground silo some ensilage that remains cool in the box. It is sweeter than the rest, but I cannot ascertain from the cows which is the better, as they like both so well.

FROM AN ADDRESS TO THE MISSISSIPPI VALLEY DAIRY AND CREAMERY CONVENTION, ST. LOUIS.

ABOUT ENSILAGE—BY J. B. BROWN, PRESIDENT OF THE N. Y. PLOW CO.

The one commodity which has never yet been overproduced or underconsumed is *good butter*. Three-fourths of the people of this country have never tasted it. It is not to be found in either of the great retail markets of the city of New York, Washington and Fulton; and the restaurants where it is served are very few in number, and known only to the initiated resident or wealthy visitor. It is almost a misfortune to have acquired the habit of using fine butter, since it is a taste that must often be shocked, but it is a tempting field for those manufacturers who have the capital and the skill. It

requires a combination of the best milk-producing food, the creamiest cows, and the well-equipped and well-managed factory.

. . . . . .

A home is not the proper place, and women who are interested and occupied in the care and various duties of the family are not the persons to produce the best butter. There is one point, however, in which the dairy butter excels the creamery butter. It is easier for the housewife to cut out the layers. If the creamery, too, was divided by sheets of white paper into horizontal layers it would do away with this little objection. The largest Eastern breeders of fine cattle say that the best stock of cattle is being bought by the farmers of the Mississippi Valley. This part of the country is liable to interruptions in the supply of green fodder by drought and frost, so that there is need of reservoirs of food—*milk-creating food*. It has always heretofore been considered in the Eastern States to be poor farming to sell hay and straw instead of consuming it on the farm, thereby increasing the manure supply; and a poor calculator, who has his cows come in during the winter season. The discovery of the method of keeping green fodder in a *green state* by the *system of ensilage*, which is now in its *eleventh* year in France and *eight years* old in this country, has reversed these rules. It has made the hay crop a surplus product of the farm, and provides a food whereby the winter butter can be made as *cheaply* as the *summer butter*. It has doubled the value of the corn plant and made of farming a surer and more attractive occupation than before.

The cost of a silo is entirely in the power of the farmer. A trench or hole in the ground silo will make nearly as good ensilage as the more expensive concrete or masonry silos. Safe from frost, fire, vermin, growing in fertile soil to enormous weight, maize ensilage is the cheapest crop to produce and harvest. The days of doubt and of experiment are past, and those farmers who still prefer to depend upon dry fodder from their barns and stacks, and upon the uncertain root crops for their winter cattle food are more conservative than economical, more cautious than prudent, and are resisting through ignorance and *inertia*, the greatest blessing that has ever befallen the world, and which adds to its capacity to support life *ten fold*, and brings the possibility of a comfortable supply of animal food to all its inhabitants.

If the farmers of the Mississippi Valley have any lingering doubts as to the healthfulness of maize ensilage, or as to its effect upon the product of the dairy, they will dismiss them forever when they come to visit any of the fine farms in the East, that are run upon that principle.

Dr. Pratt, the famous Holstein breeder of Illinois, says, Jan. 2nd, 1884: "I am using ensilage now for the fourth year from my ground silo, and though I have seen a great many silos, I have yet to find one where the ensilage is as sweet and green as mine. Anyone who can dig a hole in the ground five or six feet deep, fill it with fine cut feed and cover it with a foot of earth, will get as good ensilage from it as though he spent $1,000 to build one. There is also, less trouble in taking it out and no more loss."

The farm of Francis Morris, of Maryland, is the real Mecca of the American ensiloer; and Mr. Morris is the true prophet. There he can see the first practical silos made in this country, now seven years old, eight times filled with more than 800 tons of fine cut maize and clover. These trenches cost only a few days' labor of oxen and scraper, and are used year after year.

In 1880 there were five silos only in the United States; now in New Jersey, Penn-

sylvania and New England, there are several hundred; and thousands will be built the coming year.

It is the salvation of New England, where the abandonment of farms has been going on for some years, and the cheaper living foreigners are taking the place of the original settlers and their descendants.

The Mississippi Valley is not without its testimony. Here is a letter from Sedalia, Mo., Jan. 3d, 1884, from a farmer who ensilaged last spring several hundred tons of fine cut rye; he says: "I built a second silo this past fall, 80 feet long, 16 feet wide, and 24 feet deep—divided into five sections. I filled four sections with sowed corn, and one with second crop clover. I have been feeding corn ensilage since the 4th of November, and I find it a grand food for milch cows and mules. I am feeding 120 milch cows, and 112 mules on this food. My horses, mules and working cattle I feed on clover ensilage. My silos kept splendidly; only a little on top was damaged.

J. R. BARRETT."

When the farmers of this great valley, blest with the fertile soil that makes production cheap, shall have realized the value of this system and shall have provided the animals and the factories proportioned to their vast acreage, the days of suet butter and lard butter will be short. Oleomargarine came as a welcome relief from the misery of rancid, greasy butter, to which those of moderate incomes in cities had to confine themselves. Useful and valuable it has been, but it leaves a tallowy flavor in the mouth, and it must go.

Ensilage is an additional argument in favor of free trade. With our tropical sunshine and invigorating winters, and the system of ensilage reservoirs enabling us to pour forth a continuous supply of the best butter, cheese, meat and leather, we can preserve the balance of trade without any tariff. As much greater as the corn plant is than meadow grass, so will the capacity of this country to support life be greater than the acres of Europe. Where they have the sunshine they have not the soil, and where they have the soil they have not the sunshine.

The contents of a silo should be all of the same character as to moisture; that is any mixture of dry material or of bran is objectionable and liable to injure both kinds of material; therefore, all mixture should be made at time of feeding or a little before.

Mr. Henry Woods, of Merton, England, in his famous lecture on Ensilage, delivered at South Kensington Museum, under the auspices of the Prince of Wales, says: "The silo is much more than a reservoir for preserving—it is a machine for making food. When the silo is closed and weighted the process of fermentation goes on uninterruptedly and the ensilage contracts but one crust of deteriorated material instead of the two or more which are found whenever the silo has been re-opened and re-filled. Various mechanical contrivances for weighting are in operation but the dead-weight principle, simple and primitive, is preferable. The chemical work of the silo I believe to be best promoted by the more gradual and continuous settling.

In order to avoid the loss of space by settling after filling, and the loss of quality by re-opening and re-filling, we use at Merton a simple contrivance at a trifling cost—a super-silo.

Chaffed grass packs much more closely in the silo than the long, so that shrinkage is much reduced. It has a wholesome, vinous smell and is fresher and greener in color than long ensilage, which gives off the odor of decomposing vegetable matter. I have examined many samples of ensilage and though I have found some of the unchaffed to be decidedly good it was not equal in quality to that which was chaffed. There was a perceptible difference in the aroma. While the silo system enables the farmer to gather his green crops under unfavorable conditions of atmosphere it does not follow that these do not ultimately affect in some degree the quality of the ensilage. It is undoubtedly desirable for the cutting and cartage to take place in weather that is neither too wet nor too dry.

Ensiled buckwheat is a healthy and nutritious feed for horses and cattle. It should be cut when the seeds of the upper flowers are turning brown. The buckwheat came out of the silo in excellent condition and was greatly relished by the stock.

Ensiled maize I have raised to the extent of 28 tons to acre, six feet high; some of the stalks five inches in circumference. We reaped it with hooks as close to the ground as possible and laid it upon cords about four feet long, to each of which an iron ring was attached, the armfuls alternately reversed which assists in the distribution in silo; thus facilitating carriage to silo. The silo was filled and closed the same day. When opened the woody fibre of the stalks and knots was wholly changed in character. I have previously fed cows with green maize chaff. They first ate this chaff very unwillingly and suffered in a way which I ascribed to the indigestible nature of the outer rind of the stalk. The improvement by ensiling it is not now a matter of conjecture but fully corroborated by actual practice. As to the relative value of a crop of Swedes turnips and a crop of maize, grown side by side: allowing $3.75 per ton for the 18 tons Swedes, and allowing the 26 tons maize to be worth one-third the value of hay at $20 per ton, and deducting the cost of producing each crop, we have the large balance of $78 per acre in favor of ensiled maize.

Spurrey, the clover of sandy soils, is an excellent food for sheep and cattle. It may be advantageously cultivated on light lands. We shall seed down this year 120 acres, the larger part of which will be ensiled. Cows prefer spurrey ensilage to grass ensilage. It possesses a flavor peculiar to the plant and contains in large proportions albuminoids and

fat. The seed capsules were apparently as perfect as the day they were ensiled. It is one of the richest materials for conversion into ensilage. I have ensiled in casks, maize, oats, buckwheat, spurrey and common grass, and it all opened sound and good. A 60-gallon cask will contain 31 stones of ensilage, or a quantity sufficient with some meal and a little hay to support a cow 9 or 10 days; and would be an undoubted boon on board steamship. An animal so fed would require much less water than if only given dry food. Crops may be ensiled in casks available for cow-keepers in large towns."

I have never favored the idea of shipping ensilage from the farm in its green state, nor of any kind of portable silo. Anyone who has seen evaporated ensilage recognizes the superiority of that material to the ordinary sun-dried or air-dried article; therefore, I think that kiln-drying will become a farm process by which the ensilage material, pressed into bales, may be made an article of commerce for cities, ships, etc. The water thus evaporated, without hardening the fibre, may be restored to it at time of feeding.

J. B. BROWN, *Secretary.*

REPORT OF A BRITISH CHEMIST, 1884.

We may look upon it as a fact that in a well-appointed silo the green material put into it goes on in a healthy living state, but with slower changes than occur while growing. The material only really dies when it decays, and decay will not take place so long as active oxygen is kept out of the mass. This oxygen, or in other words atmospheric air, is kept from permeating the substance by reason of the slow but constant evolution of carbonic acid gas, and by a sufficient pressure being put upon the material to squeeze out as much air as possible in the first instance.

It is found that beer of very weak alcoholic strength may be kept almost indefinitely by a constant pressure of carbonic acid upon its surface. Another adjunct towards the preservation of ensilage is low temperature. Experience must prove what range of temperature is most beneficial for the due perfection of result; but I feel certain that when their proper conditions are fulfilled the change which takes place in the silo is of the character mentioned by me in my previous report on grass ensilage—namely, a partial digestion. The most cursory examination of the juices of the fresh plant and the juices of the same plant when properly ensiled, will show that a decided change has taken place—difficult to define, perhaps, but nevertheless of a healthy, living character, and I believe

in a much better condition for immediate assimilation by the animal economy.

I will summarise here what I consider to be the chief advantages derivable from the process of ensiling such green crops as may be safely so treated as compared with drying them in the form of hay.

It is, unfortunately, too well known that of late years especially the nutritious qualities of the various grasses made into hay in this country have been seriously damaged.

The long periods of exposure to wet, and the increased mechanical treatment the hay has received, have resulted in the bruising of its texture, so that the vital juices have been washed out; besides which the finer portions containing the most nutriment have been detached and lost, and a further deterioration has arisen from undue fermentation in the stack, or even in the field itself.

The analysis of the specimen of hay shows that the whole of the nutritive properties have been preserved intact; but it also shows that there exists in it a very large per-centage of useless woody matter which has to be laboriously masticated and ruminated before the valuable constituents are extracted. This all means muscular work which must necessarily consume a large proportion of the total energy of the food before a particle of permanent fat or flesh is laid on the animal. The poorer the quality of hay, the greater the amount of useless work occasioned. Experiment has proved that animals fed on inferior clover hay not only do not gain weight, but actually lose it, although they had no muscular work to do other than that which was involved in feeding.

In the case of well-made ensilage, we always find that the proportion of indigestible woody matter is reduced to the lowest point, while at the same time occurs the same beneficial change which takes place in hay—namely, the development of the aromatic constituents of the plant, which certainly renders the food palatable, and, it may be, more nutritious. But by far the most valuable feature in ensilage is the preservation of the juices of the plant in a soluble form, and apparently even in a more nutritious condition than they exist in the fresh plant. It must be conceded, I think, that if even the silo only enabled the stock-feeder to preserve the food in as good a state as when fresh, it would be an inestimable boon; but a comparison of the analytical results between fresh and ensiled grass and maize points to a still further gain in the improved condition of the material, so far as its assimilable properties are concerned.

It may be urged that hay has the advantage over ensilage in that a con-

siderable portion of actual sugar is produced, but on the other hand it is very difficult to prove that this is a positive advantage, knowing as we do how the animal economy is able quickly to convert soluble carbohydrates into sugar or its equivalent, while we are sure that in carefully-made ensilage no practical loss of these important compounds occurs such as is constantly taking place in badly-made hay.

FRANCIS SUTTON, F.I.C., F.C.S.,
Chemist to the Norfolk Chamber of Agriculture.

THE THIRD ENSILAGE CONGRESS.

THE THIRD ENSILAGE CONGRESS met at the office of The New York Plow Company, January 23, 1884. Dr. A. S. Heath, of New York, was elected to the chair. Mr. John Mayer, of Havemeyers' farm, presented the gentlemen present with samples of ensilage butter. A committee was appointed to get at, if possible, the objections to the use of ensilaged food in dairies that go to condensed milk factories. M. C. Weld introduced Prof. Manly Miles, and has prepared the following report:

This year the assemblage consisted chiefly of farmers and practical men, with less of the show and "talky-talk" element than heretofore. There was rather a strong representation of Dutchess County farmers present, who wanted to hold a sort of indignation meeting because Mr. Borden, of the Milk Condensing Company, will not buy milk which comes from farms whereon ensilage is used. Those farmers have either unfilled silos, or they have their stalls full of steers which they are fattening very satisfactorily on ensilage. They offered resolutions which the meeting passed, requesting the Government to analyze "ensilage milk," and report as to its healthfulness.

I presume if this were to be investigated, we should find that some ensilage produced excellent and some horrible milk, because some ensilage is itself good, while other is sour and bad in the extreme.

It is well known that the chemists, upon whom we have depended too much for knowledge of this material, have been all at sea about it. They have come to different conclusions; they would not tell us what or how much acid was present, and no two analyses agreed. The simple fact is that the substance varies so much that nobody has been able to tell what it really is and how to get it uniform, one silo with another, or one year with another.

We had at this meeting the reports of enthusiasts, as usual; excellent butter made from the milk of ensilage-fed cows, and samples of moder-

ately sweet and of very sour maize ensilage. We had reports of ensilage killing horses, and of horses which throve upon it, while all were of one mind in regard to cows.

PROF. MILES ON FERMENTING ENSILAGE.

The feature of the meeting was a talk from Prof. Manly Miles, of Amherst Agricultural College, Mass., explaining the newest views in regard to the nature of fermentation, and offering a probable solution of some of the grave difficulties which those who put in ensilage labor under.

The mass of green fodder placed in a silo begins to ferment almost immediately. This fermentation has been thought to be due to the action of the oxygen of the air, as indeed it is in part, but all true fermentation is now known to be primarily due to living organisms, which produce fermentation as a function of their life. Fermentation should therefore be viewed, not as a chemical, but as a biological process, and Pasteur, to whom the world is infinitely indebted for knowledge upon this subject, defines true fermentation to be "the direct consequence of the processes of nutrition, assimilation and life, when they are carried on without the agency of free oxygen," or "as a result of life without air." Accepting this definition, Dr. Miles shows that when air is excluded these organisms live and increase at the expense of the substances which are undergoing fermentation.

There are two principal groups of these organisms. One increases by a process similar to budding, to which group yeast and alcoholic ferments belong. The other increases by fission or division, and includes the *Bacteria.* These cause lactic, butyric, and other similar kinds of fermentation as well as putrefraction. It is these bacteria with which we have chiefly to do in studying the fermentation of ensilage. So long as they live they injure the product.

In studying the best means to kill them, Dr. Miles found that the temperature of the silo with which he was experimenting, and which had been tramped in the filling, after the approved fashion, varied considerably soon after filling, but did not rise above 87 deg. He found that on the next day after the silo was filled it abounded with bacteria which exhibited great activity and were increasing rapidly. He found that when he removed this ensilage and heated it he could kill the bacteria; that the heat required was, under different conditions, from 115 deg. to 122 deg.; but that in order to kill the germs (seeds or spores) from which fresh crops of bacteria might come requires the moderate heat to be kept up for

several days, or high heat for a short time. The effectiveness of a low degree of heat—say about 122 deg.—maintained for several days, was accounted for by supposing that at this temperature the spores will hatch, and the young bacteria will then die.

When these facts were ascertained, Prof. Miles made great search for reported experiments with ensilage which gave the temperature of the silo at different times, but sought long in vain. Finally he found the report of Mr. George Fry, in England, whose experiments were made last summer. One silo was filled with crimson clover, red clover, and rye grass, between the 7th and 30th of June. When covered, the heat of the silo, six feet below the surface, was 132 deg. It was uncovered and filled up, as it had settled considerably, on the 17th of July, when a temperature of 140 deg. was observed. Another silo was filled between June 30th and July 11th. In this the temperature on July 7th was 149 deg., and on July 14th it was 158 deg. When these silos were opened late in October the ensilage was found to have a brown color, a sweet and pleasant odor, to be free from acidity, and greatly relished by cattle, sheep and horses.

This case is, of course, strongly confirmatory of the professor's views, and shows, *first*, that a sufficient heat may be easily obtained, provided the material be not tramped too much, and the silo not filled too quickly; *second*, that the heat once obtained will continue, after the silo is closed, long enough to kill the germs of other crops of bacteria.

The air is full of the germs of these organisms, but it has been proved that they can be *filtered* out of the air. Air drawn through a mass of cotton wool is effectually filtered free from them. Consequently if the silo be well closed and under reasonable pressure, say 100 pounds to the square foot, air which might penetrate would be deprived of its bacteria at the surface.

When ensilage is exposed to the air the yeast ferments, and those organisms producing mould and putrefaction have opportunity to act; but these last cannot act when the initial fermentation is at its height, because of the development of heat and carbonic acid gas.

This is the substance of the practical part of Prof. Miles' talk as I understood it, and it seems to me the most important contribution to our knowledge on this subject which has been made since it was demonstrated that ensiloed fodder could be kept, and would prove of value for feeding purposes. It offers a solution of the Dutchess county difficulty which time may work out. It gives us ground to hope that ensilage in the future

may have some nearly constant and uniformly good qualities, and that the objections to it will disappear in improved practice.

Peter Henderson, of New York, introduced a gentleman whose occupation was exchanging fine cattle, and who had traveled widely. He had found the highest health and best appearance in the stock that received rations of ensilage, and thought that the silo would become an essential part of every breeder's farm economy.

Elder F. W. Evans, from Mt. Lebanon, N. Y., was introduced as representing one of the healthiest and thriftiest families in the country. He stated that they regarded their silos as very valuable—that all their horned cattle were fed from them, and they had never observed any care as to quantity fed to be necessary as affecting the quality of the milk, butter or cheese.

Mr. H. H. Brown, of Orange Co., stated: The failure of my clover ensilage to keep as well as last year, I think, is due to the fact that it was not cut. We found when the silo was opened that there were places very mouldy, owing to the uneven packing, although great care was taken to get it evenly packed.

THE VETERINARIAN'S REPORT ON HORSES OF F. S. BRONSON, CT.

To five of the horses (those working at farm work), were fed half a bushel of ensilage, a bushel of cut hay and seven quarts of crushed oats, at night, with oats morning and noon. Two others and the donkey were fed about 1½ bushels ensilage and a bushel of carrots. The first five mentioned were fed nine days; the others about three weeks. Those fed the longest were taken ill first, but only a few days before the others.

The first noticeable symptom was a difficulty in drinking. Then followed an inability to swallow food, a trembling of the limbs, usually the hind limbs first, though in one case the fore limbs were attacked first. When placed in a loose box the animal would appear uneasy, walk around the box, lie down, resting the muzzle on the straw as though his head was heavy. These symptoms were all gradually increased until the animal was unable to rise, when they would for the most part lie quiet, with occasional struggles, depending some on the disposition of the patient. At no time was there much elevation of temperature, 103° being the highest, and the average was about 101.5°. The pulse was from 50 to 60; respiration from 18 to 25, according to whether the animal laid quiet, or not. They seemed to be perfectly conscious of what was going on around them up to a short time before death, showing that the major portion of the brain was in a natural condition.

Post mortem appearances: The principal lesion appeared to be in the throat. The mucous membrane lining the pharynx and larynx was of a dark color, and was infiltrated throughout its whole thickness. The stomach and intestines were all normal. Also the other organs in the abdominal cavity.

I am at a loss to account for this being the only lesion noticeable, but that it was not the only lesion is proven by the fact of the horses becoming prostrate so soon, and death

following so quickly. There were no noticeable clots in the brain, and the brain substance seemed to be in a healthy condition as far as could be told by an ocular examination.

I submitted the ensilage to a microscopic examination, but could not detect any fungoid growths on it.—F. W. McLELLAN, V. S., Bridgeport, Ct.

The ensilage fed to these horses was maize, planted closely and much of it having lodged, was cut sooner than it would have been had it remained standing. Mr. Bronson believed that the acetic fermentation in the corn caused paralysis of the nervous system.

W. S. JOHNSON, Poughkeepsie, stated :

I have fed, since the 22d of September last, five last spring calves, and also a heifer dropped last October. Their only feed, with the exception of a small portion of the time, was ensilage. The exception was a small quantity of bran during the early fall. The ensilage was first from rye, then corn, and at this time of writing from clover. I expect to continue this feed during most of the summer. I never had six as fine yearlings as these, and am proud to show them to any one who has any doubt of the good qualities of ensilage.

I have, in addition, twenty cows now in their second season on ensilage. During the past winter the cows in milk had a regular ration of wheat bran, morning and evening, with the ensilage; those not in milk had ensilage only. We fed very little hay (which was of an excellent quality), as they would give the ensilage preference at all times. I am at this time feeding thirty head of cattle on ensilage, and never had cattle in finer condition than these are at this date.

CAPT. GILBERT MORTON, Vt. :

I have had five years' experience with ensilage. The first year whole corn was put into a trench ; then I tried a stone silo 60x12x8½ feet for two years, then two years with a wooden silo 19x15x13 feet in the barn. This year a wooden silo is used for some 25 tons of grass cut in June and July, and a stone silo contains about 40 or 45 tons of corn fodder —at the bottom yellow flint corn ears picked from about an acre, and filled with Sanford and Southern white corn from about four acres, mixed as we put it through the cutter. My ensilage is more profitable this year than any previous one. The corn was frosted five times, even the stalks froze and cows wouldn't touch it, and the field was white when I went to cutting. I cut the whole into half-inch pieces with a Cycle cutter as fast as two men could feed it, during wet weather. The silo was opened in 20 days and the ensilage found to be well cooked. Cattle, cows, calves and hogs all eat it up clean. I have now been feeding it a month, and everything is eaten up, weeds and all, for I mowed it.

Now here is a clear gain of enough good feed to keep my seven cows, four large yearlings, ten calves and fourteen pigs all winter, for the whole field wasn't worth $20 before going into the silo. I leave the scientists and doubters to explain how it is that I this year take something out of the silo more valuable than I put in.

My whole expense this year, exclusive of cost of cutter and engine (both on trial) is less than $1 per ton, including the grass in the barn silo. I am fully satisfied with the results of five years' trial, and would build cheap wooden silos near the place of feeding and above ground. I would open as soon as I wanted to feed, but instead of taking the weight off, move it back and double the pressure on the exposed edge. I find about one bushel of ensilage per head sufficient for the day. About two quarts of grain are mixed with it for cows in milk or fattening; the others, except hogs and pigs, have no grain. For swine I heat a kettle filled with a bushel of ensilage each day and half a bushel of meal and bran mixed with it for 14 three-months-old pigs and one large hog. Two bushels or more will be fed the latter part of winter, or in that proportion, to keep them fat right along. I keep no squealing store hogs.

From my experience I say to all, particularly if you are poor or are buying a farm, build a cheap silo, tread well in filling, with horse or oxen if practicable. Don't hire any help, but fill it yourself; if a day or two passes and you cannot fill it all at once, tread it particularly about the corners, and when done cutting put on plenty of weight. You will never regret having built a silo. Without interfering with other crops, any farm can keep double the stock it now does, and sell the hay.

This season (1884) in securing my ensilage I have followed Mr. Fry's directions, with a saving of at least one-half the expense in filling the silo, and with the additional advantage of being in no hurry in completing the operation. Before I read this communication I had commenced with storing grass, got frightened at the heat and closed the silo for a week or two. Finally I started again and soon got a temperature above 120 deg. F., sometimes 140 deg. F. and even 150 deg. F.

I am now about closing up the season's filling of the silo with everything I have raised, mixing green oats, sowed corn and grass, all put in uncut, gauging the temperature by putting into the silo an amount of material sufficient to keep the heat rising towards the surface. I did no tramping of the material in the silo except around the edges.

I have tested the grass ensilage mentioned above and find it turns out just as Mr. Fry asserts would be the case under similar treatment. It proves to be very nice, sweet, brown ensilage, having the smell of honey. Even after being dried it retains its sweet flavor. I am convinced that this method of heating will eventually revolutionize the system of filling silos, saving at least one-half the expense incurred under the old system, and giving the farmer, even in wet seasons, a perfectly well-cured crop of grass and other green forage crops. The sap and juices appear to be preserved in their best condition.

ESSEX, VT., Aug. 23. GILBERT MORTON.

FROM A REPORT OF NEW YORK AGRICULTURAL EXPERIMENT STATION.

E. LEWIS STURTEVANT, *Director.*

Two Jersey cows were selected for the experiment, and were fed alike. They were weighed each morning before being fed or watered. The food and water were weighed to them, rejected food weighed as collected from them, the milk weighed at each milking, and the excrement passed also to the scales.

During the whole period of experiment the cows received the same quantity, four

pounds each of corn meal and wheat bran, the foods experimented with being additional to this constant factor of eight pounds of grain feed per cow.

The first period of fourteen days was an inquiry concerning the value of fodder corn; the second period of seventeen days included the use of the same fodder corn ensilaged.

We have for the apparent result that the milk yield decreased during the fodder corn feeding, and increased under the same fodder corn ensilaged, and the absolute increase between the two feeds was decidedly in favor ot the ensilage.

We may summarize the result as follows:

The feeding of ensilage in comparison with the stored fodder corn from the same field was,

1st. More favorable to the weight maintenance.

2d. Less dry weight required.

3d. Less water drank.

4th. Increased milk yield.

The amount of daily feed besides grain was 11 pounds dry stalks to 33 pounds ensilage per cow.

ENSILAGE MILK INVESTIGATIONS AT THE MASSACHUSETTS EXPERIMENT STATION.

[Abstract from Bulletin No. 10.]

Three Ayrshire cows were employed in the experiment.

The analyses of the feeds given—corn meal (1), a fair article of its kind; timothy (2), cut in July after blooming and not a fair average, and ensilage (3), rather sour, the corn having been frosted before it was cut—are as follows. The analysis of the frost-bitten corn (4) before it was put in the silo is also given:

	1	2	3	4
Moisture at 100° C.	13.55	8.70	86.88	8.83
Dry matter	86.45	91.30	13.12	91.17
Ash	1.42	4.04	6.89	4.86
Cellulose	2.62	36.59	33.66	29.05
Fat	4·24	2.12	3.88	2.06
Nitrogenous matter	10.40	7.24	12.58	8.63
Non- " "	81.30	50.01	42.99	55.42
Nutritive ratio	1:9.66	1:7.8	1:6.57	1:9.83

Previous to the experiment each cow had received four quarts of clear corn meal and all the hay she would eat.

Corn ensilage was then introduced with the feed. The amount of corn meal, four quarts (6½ lbs.) per day, remained the same during the entire trial. The ensilage was gradually substituted for the hay in the daily fodder, as far as the animal felt disposed to consume it. During the first twelve days each was offered 40 lbs. of ensilage per day, and subsequently 60 lbs., besides all the hay they would consume. They varied widely in their preference, as subsequent statements show. The manner of feeding was as follows: At 5:30 a. m., the meal was fed to the animals during milking, and at 6 o'clock

the ensilage. At 12 o'clock m. from 4 to 5 lbs. of hay were offered; and at 5 p. m. the remainder of the meal was given, and the rest of the ensilage soon after. At 8 o'clock p. m., from 4 to 5 lbs. of hay were again offered. Any material remaining after each feeding was removed and weighed. As a rule they consumed first the leaves of the corn, and left, if any, more or less of the harder stem parts behind. They received twice per day all the water they would drink. The experiment extended from May 1 to June 10.

Comparing the analysis of the ensilage (3) with that of the frost-bitten corn fodder (4) shows a decrease in non-nitrogenous and an increase in nitrogenous constituents. It appears also that the nutritive value of the corn-fodder had been greatly enhanced by the ensilage process, the nutritive ratio (that is, the ratio of nitrogen-containing food constituents to non-nitrogen-containing constituents) having been raised to that of our better grasses. This result is not an exceptional one in character; it is only marked in degree—judging from well indorsed observations in competent hands elsewhere; and is co-operated in the case of all kinds of ensilage. Yet these changes in quality are accompanied by a considerable destruction of valuable organic matter. The fact that the nitrogenous constituents (crude proteine) resist better the destructive influences in the ordinary silo, than the non-nitrogenous plant-constituents—as starch, sugar, cellulose, etc.—is the real cause of the alteration in the nutritive character of the fodder in consequence of our present management of the silo. An analysis of the liquid, which under a partial pressure upon our ensilage accumulated upon the cleaned floor of the silo, admits of no other explanation.

THE RESULTS.

The cows, with the exception of No. 1, retained their original weight well.

The cows differed widely in their preference for ensilage.

The quantity of milk has in every instance increased, in consequence of the addition of ensilage to our customary mode of feeding, counting the amount of dry vegetable matter in each case pound for pound with the milk produced.

The increase in quantity of milk, counting on the basis of the total amount of fodder consumed, was most pronounced in case of moderate quantities of ensilage; i. e., from 35 to 40 pounds per day.

The quality of milk was not perceptibly changed, as far as the density and the amount of fat was concerned.

From JOHN HUNTER, Sterling Valley, N. Y.

I have 56 head of cattle. I ensilaged clover in July when in flower, chaffing it one-half in, filling slowly about eight days to two silos, trampling all the time, stone silos 30x18x16 feet deep. Mowed in the mornings and filled in the afternoon. Cattle like it better than corn ensilage. In September I opened the silos and filled up with corn. I feed it by mixing the clover and corn. The clover is perfectly sweet; the corn was cut quite green and is slightly sour. Hereafter I shall ensilage all my stalks after pulling the ears.

I feed ensilage night and morning with one quart each of wheat bran, corn meal, oil meal and hay at noon. I don't ever expect to farm without silos.

COMPARATIVE VALUE OF ENSILAGE.

The meal fed to the cows is worth $22.40 per ton. That fed to the bull calves, $25. Hay is worth $10, and corn stalks and oat straw each $5 per ton, and rutabagas 40 cents per bushel. Compared with the other feeds at the above rates, the ensilage has a feeding value four times the cost of growing the crop and putting it into the silo.

I was not at all sanguine, when we began the experiment, as to the decided merits of ensilage as claimed by many writers, but I have been greatly pleased with the results of the feeding. The convenience in handling the prepared fodder; the large amount that can be stored in a small space; the avidity with which cattle eat it and thrive and grow when a meal ration is fed with it; the fact that it can be stored in a wet time, during lowery weather, when fodder could not be cured; the furnishing of succulent food for stock during our long winters, at very small cost—these are some of the reasons that lead me to think the ensilaging of corn especially will prove to be a practical and profitable method of preparing food for stock. I think it may take the place of roots and be a cheap substitute for them.

SAM'L JOHNSON, *Prof. of Agriculture,*
Agricultural College, Lansing, Mich.

From Sr. LUIS DAVILA Santiago de Chile, July 8, 1884.

I congratulate you on the publication of Report of Ensilage Congress of 1882, which accidentally reached my hands, and the translation of which I have just made. I am an enthusiastic admirer of ensilage, which I became acquainted with in Europe in 1874, by the publications of Goffart, Lecouteux, and others.

Last year I made a trial of ensilage, *the first one who has done so in Chili.* I have a dairy with 100 cows, which I feed on ensilage maize, and clover, which has turned out in a perfect state of preservation. Four or five agriculturists who have been encouraged by my example, have joined me in ordering as many machines.

LETTERS TO THIRD ENSILAGE CONGRESS.

BOSTON, Mass., Jan. 19, 1884.

I shall be unable to attend the meeting of farmers interested in ensilage on the 23d, but my experience as an *amateur* may possibly be of some service.

I keep two cows for family use and I have two small pits. I began by separating one end of a small root cellar from the rest of the cellar with a brick wall, and I also put in a cross-wall so as to make two pits six by six and one-half feet, and ten feet deep. Upon this I built a wooden curb, the interior wall of the curb being flush with the cement wall of the brick work, giving me a total depth of about seventeen feet.

One year I filled these two pits, half with Southern corn and half with rye, produced on an acre of ground, two crops in the same season, but I did not find the rye profitable. This year we planted about another acre with sweet corn, made a good crop and put away substantially 1,000 cubic feet.

In the two previous years I had fed by cutting vertically and we suffered a good deal of waste. This year we feed from the top *horizontally.* We find that we remove

the ensilage just fast enough to avoid mold or waste, of which there is scarcely an appreciable amount. We began to feed a month earlier than usual on account of severe drought, and at the rate at which we are feeding the stock it will last till the pasture comes in, or longer. Yours very truly,

EDWARD ATKINSON.

A. T. THOMAS, TREASURER, UNION STOCK YARD AND MARKET CO.,

Room 15, Grand Central Depot,

March 10, 1884.

This is my third season of feeding ensilage to cattle, and the favorable opinion formed at the end of the first season has in no degree diminished and on the contrary is fully confirmed by the further experience gained during the two succeeding seasons —in fact, I do not well see how I could profitably get along without it. My silo is all above ground, and inside of tarred wood.

It is an inexpensive structure and as yet shows no signs of decay.

I have heretofore filled it as rapidly as possible, thinking it necessary, but during the coming season intend to take more time in filling and thus allow other work to go along at the same time.

I am further induced to adopt a course of more leisure in filling from the fact that of late it has come to be regarded as a sort of second harvest among day laborers, and their prices have been governed accordingly—in other words, they have "charged all the goods will bear," and during the past year a little more than they will bear.

The absence of any real necessity for rushing work along when filling, I apprehend, will allow of greater independence in hiring help.

My expense each season, thus far, has been such as to convince me that, owing to frequent and protracted droughts of this latitude, the proper time to sow seed for maize ensilage is as early in the spring as the ground will allow being worked.

I have a neighbor, a poor man, who managed to put up a cheap wooden silo, and now on an originally unproductive farm is keeping quite a large stock. His verdict is emphatically for the system, and he unhesitatingly asserts that without it he could do nothing but hand his place over to his creditors.

Very truly, A. T. THOMAS.

AFTER ANOTHER SEASON.

J. B. BROWN, ESQ.: NEW YORK, Oct. 20, 1884.

Dear Sir—I presume you will cheerfully take the time to read that slow filling has proved a success in loading up my silo this season. I opened it about a week ago and can assure you that while all the stalks are not absolutely sweet, yet much of it tastes as sweet as when put in.

The ensilage, not actually *sweet*, is only slightly tart and as I have heard no complaint from the milkman I conclude he has discovered no change in the feed of the cows. Cows eat it clean and are thriving finely.

I ought not to be feeding ensilage at this time of year, but we have had no rain in a long time of any account and pastures are dry as a pepper pod and am forced to feed to keep up the supply of milk.

I filled so slowly that it took us near three weeks to get in 35 tons. We cut only a little while in a forenoon, and often left it without adding, for two or three days. It got pretty hot, but I can't say whether the bacteria were scorched or not.

I noticed a long article last week in the *Country Gentleman*, the purport of which went to show that a temperatur of less than 212 only "warmed over" the bacteria but didn't boil them dead.

Whether bacteria boiled at 212, and therefore "well done," is a better dish than if "rare done" at a less temperature, my cows as yet have had no opportunity to test.

I made a hole several times in the ensilage and stuck a thermometer down, but never got above 140.

As this ensilage is *good enough*, I conclude that half-cooked bacteria will answer.

It is proper to say that my silo was, in June, filled with clover, uncut and weighted down. In September it was uncovered and filled up with fodder-corn. It had settled just about half—that is, the silo sixteen feet deep was filled up eight feet only, after two months' settling.

The clover, with the exception of six or eight inches at one end, was in fine condition, much of it looking a pale-green. Some was dark-red, and smelled a perfect imitation of *plug tobacco*. Scarcely any was decayed, and that only at the end referred to.

Had all been tramped alike, I have no doubt all would have been preserved alike.

The filling was neglected in that respect, and I discovered that fact just before the covering was put on, and had it remedied so far as possible at that late date.

Clover was also put in very slow—just when most convenient. Some of it had a little rain and morning dew in it, but most of it was without other moisture than the natural sap. Cows were a little in doubt about the wine-colored clover, but it proved much better than it looked, and they decided to take all that came from the silo, red white, or blue. I remain, yours truly,

A. T. THOMAS.

From HENRY STEWART, Hackensack, N. J.

Let me warn you against cotton-seed meal. I have had to abandon it, much against my will. It is too exciting and concentrated for cows.

STEPHEN HOYT'S SONS NEW CANAAN NURSERIES.

DECEMBER 16, 1883.

Our clover ensilage is strong. It was put in quite green. The day we commenced to cut and fill it was foggy, and we had in the night following a heavy thunder storm, The next day was cloudy and the water dripped from the load so as to keep the barn floor wet all day. Yet we put it in. We commenced in August to feed. The cows ate it but it had a very bad odor—so much so that the smell from it was so offensive to the New York people we had boarding with us that we had to close it up and stop feeding. We commenced again in October and as we got down into the silo, it seemed to be stronger, yet was good color and those who saw it pronounced it good, bright, looking ensilage. Our milk tasted of it and also butter. The clothes of any one going into the barn, when this was being handled, smelt so that it was offensive to come into a

room. It smelt some as one would if he had been sewing fertilizers. Neighbors have smelt it half a mile away. We are now feeding it to oxen and young cattle and some to milk cows. The clover was put in without cutting.

Our corn ensilage is better. The cows like it better and are improving on it, and our milk and butter do not taste of it. My brother, Mr. James Hoyt, is carried away with it and was before we had our silos.

We have a bull that has been fed on corn ensilage and two quarts bran, that gained 25 pounds in one week. A one-year-old bull fed with ensilage and no meal gained five pounds in a week. A pair of three-year-old steers fed on clover ensilage and one-half bushels turnips each per day, gained 47 pounds in one week. A three-months-old calf fed on corn ensilage, turnips and a little meal and bran, gained 17 pounds in a week.

EDWIN HOYT.

From WM. H. GILBERT, Manufacturer of Fine Butter, Richland, N. Y.

January 29, 1884.

I have never ensilaged anything but maize. That has always come out right. Last winter I fed my stock no dry fodder from October to June, and they done first-rate, in fact better than I ever had them before and I think better than this winter, when they have had one feed daily of hay; have had the latter only since 1st of January. I think that any failure to get good milk from corn ensilage is caused by cutting the corn too soon. It should stand until the corn is large enough to boil. I get a much better product from that kind of ensilage. I am a stronger advocate of the silo system this winter than ever. I have many visitors, and all pronounce my stock in the finest condition of any dairy in this section, and nearly all express surprise to see milch cows look so well in winter on the small amount of grain fed.

G. W. FARLEE, TRENTON, N. J., TO "COUNTRY GENTLEMAN."

ENSILAGE AND ROOTS.

Editors Country Gentleman:—I note that Mr. William Crozier continues his opposition to the use of ensilage. Nevertheless, I am inclined to believe that he will eventually come to believe in its value. Like most successful men, I fear Mr. Crozier is a little set in his ways. He may not be aware of it, but I think he is already using food for his cattle that resembles ensilage. He appreciates the necessity of succulent food for the best results in the dairy. The more succulent the food consumed by the cows, the quicker and more completely the work is done by the churn. Now Mr. Crozier aims to secure this succulence by the use of roots in winter. By the use of a pulping machine, requiring horse-power to work, he macerates his beets, and mixes a large bulk of these with chopped corn fodder and ground feed in sufficient quantity. This mass is wet with water, and then banked and left to "heat a little." "Heating a little," if I understand it, means slight fermentation, and that is just the condition we get in ensilage.

Mr. Crozier's plan is one which has been practiced in England for years, and is one of the facts or experiments that led me to believe in the safety of the use of ensilage. I adopted its use advisedly. I postponed building a silo for nearly two years, until I

could get the reports of the way it worked with practical farmers. I consulted a well-known analytical chemist, who is also a practical farmer, as to the effect of the slight acidity in ensilage upon the butter, as I could not afford to risk the possible damage to my butter, which commands a fancy price by virtue of its superior quality. His opinion was very decided that while it might possibly affect the milk, so as to disagree with weak stomachs or infants, yet there was no danger to be apprehended of injury to the butter. Whatever of acidity there might exist in the milk would be thoroughly washed out by the buttermilk and in the process of churning, and my experience shows that he was correct.

It is the verdict of my dairywoman and my customers, that we have never made better butter than in mid-winter when the cows are fed ensilage. My experience, though slight, as to the keeping quality of such butter, does not correspond with that of the butter dealer who visited Mr. Crozier. Last winter, at the request of one of my lady customers, I shipped to Florida 50 pounds of my butter, printed in pound lumps and packed in a tin case. It is well known that butter thus packed does not keep as perfectly as when packed in a solid mass, yet this butter remained in good condition in that mild climate, and the last pound used, probably three months after shipping, was pronounced prime. This same lady customer has just ordered 25 pounds, at my top price, to be shipped to another lady friend of hers in Dutchess county, N. Y. I use about six pounds of hay per day to each cow, besides ensilage. I would feed this quantity of hay in summer if I were practicing soiling.

The prepared food which Mr. Crozier uses is undoubtedly excellent. I fed precisely the same for years, except that I did not let it ferment before feeding; but the expense of its preparation is too great. Say what you please, cultivated after the best labor-saving methods, the root crop is a very expensive one to grow. I believe I can grow ten tons of green corn fodder at as little expense as one ton of beets. Ton for ton, I believe the feeding value is about the same. Beets and green corn fodder contain about the same percentage of water and nutriment. In addition to the expense of growing the beet crop is that of harvesting, stacking or shocking the corn fodder, handling it a second time when dry in chaffing it, besides the further labor of mixing the mass preparatory to its ultimate use for feeding. I estimate that making ensilage of corn fodder is no more expensive than was my old practice of drying it, carting it to the barn, and then passing it through the cutting box, and preparing it for the stock. Ensilage is ready to your hand in the short days of winter, when I find my men are about as busy as in the long days of summer.

From J. P. JOHNSON, MANAGER FOR R. M. HOE, Brightside.

Feb. 6, 1884.

Both silos are now open and I have fed alternately out of each. I must say that the one that was most rapidly filled the cows liked best. It is brighter in color, stronger fragrance, and not so solidified as the other, which was filled slower. I am convinced that the more rapidly it is filled the better. Our sorghum is much more sour than the corn, although some cattle eat it just as well. Our ensilage corn is not so acid as last year.

Mr. Hoe's silos were again filled with corn in 1884 as rapidly as possible, and no finer looking or finer feeling herd can be found. Very little, if any hay, is fed on this farm. J. B. B.

From the AUTHOR OF "FEEDING ANIMALS."

LAKE VIEW, ERIE CO., N. Y., Jan. 22, 1884.

J. B. BROWN, ESQ.:

Dear Sir—I should like to meet with you to-morrow in conference upon ensilage, but my health will not permit. The system is making steady progress, but not so rushingly as two years ago. People are studying it practically, and those who are capable of seeing its good features and of discovering errors in practice, will abandon the latter and build up the former. My tenant was anxious to escape as much labor as he could, and asked permission to ensilage clover and timothy without running through a cutter. That he might see just its effect I consented, and he put in 50 tons of this into the silo as fast as mown. It was weighted with one ton to the square yard. The silo was opened 20th November. It had a sweet, pleasant smell when opened, but the sides, where cut down, would mould in a few inches before it could be cut down again. The cows ate it greedily, and it produced a fine yield of milk—but after a while it became evident that the milk received an unpleasant flavor from it, and the butter was likely to be ruined by it. Having, many years ago, experimented largely with milk by heating and found that this would dissipate turnip and cabbage flavor, I believed it would also dissipate this taint from the mouldy clover and timothy ensilage. On testing, we found the butter made from it perfectly sweet, and it keeps perfect for six weeks, and probably will six months. The milk is heated immediately after milking to 140 degrees. Our customers compliment the butter as excellent. Had this clover and timothy been cut into half-inch lengths, I think it would have prevented all taint of the milk. And it is certainly reasonable to believe that ensilage, properly put up, will produce as sweet milk as grass. Clover needs to be put up with greater care, and fermentation prevented more completely than with corn ensilage, as clover contains so much more nitrogen, which assists in destructive fermentation, but one ton of clover ensilage has a value somewhat more than twice that of one ton of corn.

The friends of ensilage should now turn their attention to perfecting the system, and spend less time in raising 75 tons of corn to the acre, on paper. I believe the system of great value to this country, and that it means more dairy products, more beef, more mutton, and more prosperity in its agriculture.

Truly yours, E. W. STEWART.

HOUSE OF REPRESENTATIVES.

WASHINGTON, D. C., Jan. 23, 1884.

To the ENSILAGE CONGRESS, 55 Beekman street, N. Y.

Gentlemen—I regret my duties preclude my attending the present Congress. I wish to repeat what I have before said at previous Congress, that during the past year, I have continued the ensilage process with increasing benefit and satisfaction. From my expe-

rience I have no hesitation in saying that this method of preserving fodder crops is far more economical and beneficial to the animals fed than any method known to me.

The only change I have made during the past year from previous years is that I now cut my ensilage not over one-half inch. I think the finer the better. I do not use any weighting except the covering of earth which should be not less than eight inches. If the ensilage be evenly packed and trod in the pit, and the pit be not less than 10 feet deep, the earth covering is all that can be required. The conditions of success are exclusion of the air as completely as possible, and as nearly uniform temperature as practicable. My experience proves that the underground pits are better than those above ground.

Yours truly,

O. B. POTTER, New York City.

SIMPLER STILL—FRUIT OF THE SECOND ENSILAGE CONGRESS.

[From *Journal de l'Agriculture*, Paris, Oct. 6, 1883.]

The great discovery of M. Goffart, of the preservation of green fodder by ensilage under continuous pressure, has opened the way to numerous experiments which have revealed the immense importance of the method. But the practice of ensilage is still far from being general with our farmers and remains still the privilege of the wealthy. Many timorous agriculturists hesitate to enter upon this practice on account of the expense of the construction of a silo.

The experiments which I have made this year, having been inspired by the statements at an American ensilage congress, enables me to offer to my fellow farmers a method of procedure that is both safe, simple and involves no expense whatever.

Last spring I cut thirty cartloads of grass and rye and placed it in the corner of a shed upon the ground with a wall on two sides only. The heap measured twelve feet high and twelve feet square. I was four days in stacking it. The top was leveled and covered with a layer of planks and loaded with about 250 pounds of stone per square foot of surface. The sides remaining open were trimmed down with a scythe so as to present as clean a face as possible. The compression reduced the height in less than a month from thirteen feet to about three and one-half feet, after which it did not settle any more. The decomposition of the exposed surface caused a disagreeable odor which made me doubt the success of the experiment; but on opening this silo and making a careful examination of its condition I found it as follows: The sides were entirely putrid to a depth of six to eight inches (m 0.16 to 0.20). The surface under the plank was decomposed only to a depth of two to three inches (m 0.05 to 0.06). Below these limits the mass presented a compact, yellowish green appearance with a sweetish alcoholic odor. The cattle eat it freely and in preference to the very best of hay, and in feeding it daily it has not lost in the least its attractiveness to them. I consider it a complete success and my only regret is that of having operated on so small a scale, and the loss would be less proportionately on a larger quantity. I shall be very happy to show to my confreres so long as it lasts, the results that I have obtained.

JULES CORMOULS HOULIS,

Secretary of the Farmers' Club,

of Mazamet, France.

From W. A. PRATT, Elgin, Ills.

January 2, 1884.

To the Ensilage Congress:—I am using my ensilage now, and it is as fine as ever. This is my fourth year from my ground silo. Any one who can excavate and dig a hole in the ground 5 or 6 feet deep, fill it with cut feed and cover it with a foot of earth will get as good ensilage from it as though he spent $1,000 to build one, and less trouble taking it out to feed, and no more loss. I have seen a great many silos, and am yet to find one where the ensilage is as sweet and green as mine. I am too busy to answer letters.

FROM "FARMERS' REVIEW," CHICAGO.

Dr. Pratt's Earthpit Silo at Elgin, Ills., is simply a pit dug in the soil near his barns, six feet deep, 16x36 feet at the surface and sloping to about 10x30 feet at the bottom which, being in gravel, needs no provision for drainage. In clay or other impervious material a tile or other drain from the bottom, would seem to be necessary for an out-door earthpit silo, since, if the earth became saturated with water it would seep in to occupy the space from which the ensilage had been taken. When the time comes for filling, it is carefully cleaned out, and the sides and bottom dressed smooth. The ensilage corn is cut into inch lengths and evenly distributed as the filling proceeds, care also being taken to tramp it as firmly as possible while filling. When full and well rounded up, a horse is used for still further tramping before the covering is put on. The first thing in covering is to put on two loads of green clover, then earth is shoveled on till it is entirely covered when a team and scraper is brought into requisition and dirt furnished by the excavation is scraped on to the depth of a foot or more, to which should be added a covering of straw or slough hay to shield off rain. The filling occupies about three days, during which time a high degree of heat is generated. He has never tested it with the thermometer, but after the covering is put on it subsides, as he has found by digging into it after it has been covered for a time. In feeding from it, one end is first opened and cut down, and when that section is finished the cover is removed from another section, and so on till it is all fed out. The clover covering is the only part of the contents unfit for use. The ensilage comes out green with but slight acidity and he has never had an animal refuse to eat it when first offered, though in the last four years he has fed ensilage to over three hundred different animals. The doctor has each year grown a considerable amount of fodder corn above what he ensilaged, which he has cured in shocks and fed dry, cut the same length as that ensilaged. But he is so impressed with the superiority of ensilage that he intends this year to dig another pit of the same capacity as the present one—about eighty tons—and discontinue the curing and feeding of dry fodder corn. He says that his cows changed from dry fodder corn to ensilage will, within two or three days' time gain 20 per cent. in milk with the same grain ration; that from four cans per day they will come up to five.

He says that since he commenced to feed ensilage, four years ago, he has not lost a single cow by milk fever, while before that time he thought himself fortunate if he got a herd of forty cows through the winter without the loss of one or more from this cause. His theory is that the feeding of ensilage keeps the bowels open

and loose, and prevents the tendency to constipation which attends the feeding of dry food, especially if in large quantity, and of stimulating quality for milk production, and which causes a feverish condition of the system, which develops into milk fever at the period of parturition.

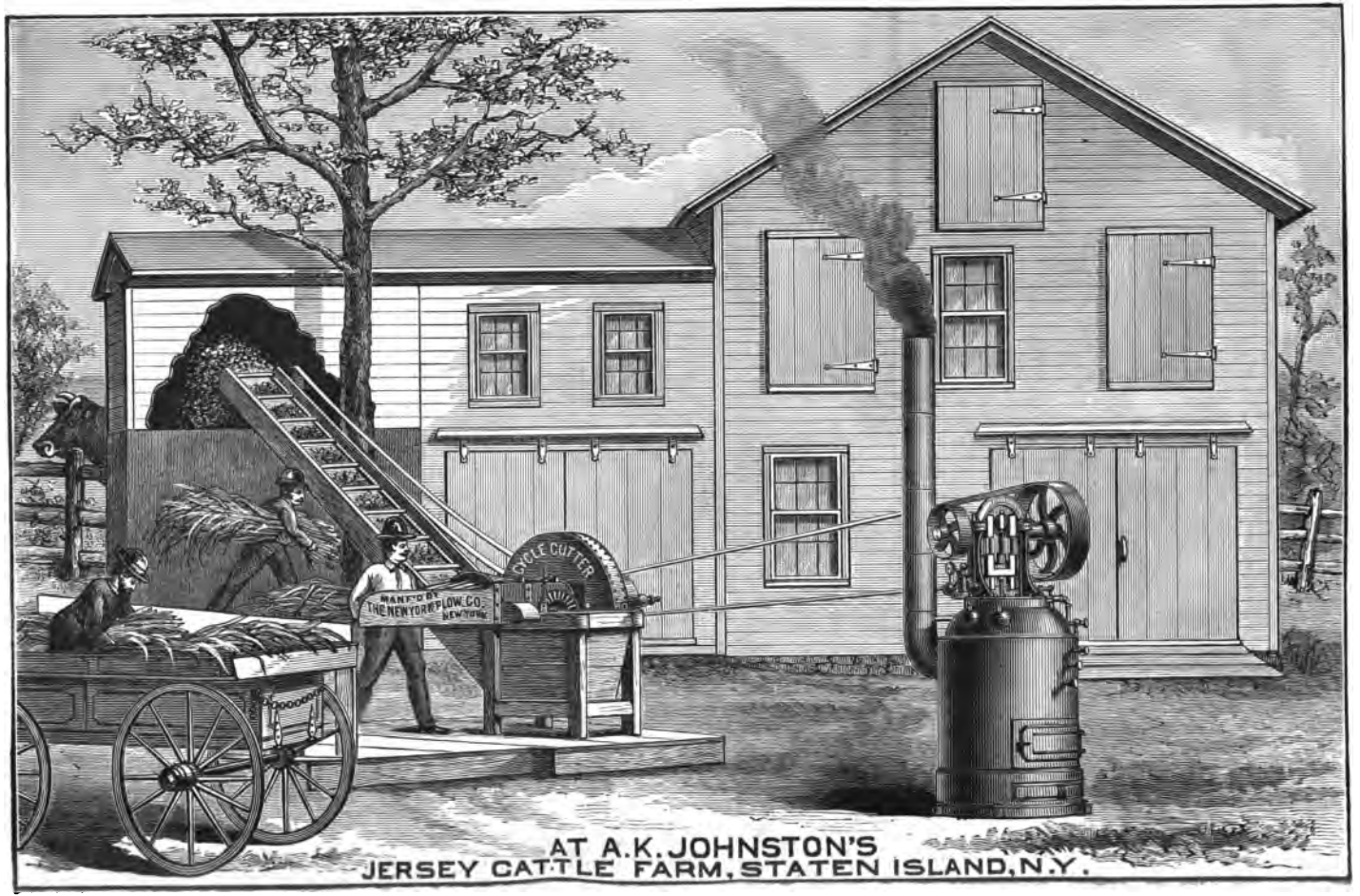
There can be no question that all animals kept on highly-stimulating food, and especially milch cows, need a daily ration of succulent food to keep the bowels open and the system in good condition. This can be supplied by either roots or preserved green fodder. But for the successful growing of roots a cool, moist climate is required, entirely different from the hot, dry summers which we usually experience in the prairie States of the West. To supply this want ensilaged corn fodder is the cheapest food of the kind that can be grown and prepared.

From American Cultivator.

Without any question, the introduction of ensilage has worked a great change in this business. It is the only plan by which any large proportion of the winter food of milch cows can be profitably grown on high-priced land. Perhaps it has not reduced the price of milk, but it has, at least, prevented a much heavier advance than would otherwise have been made. The tendency in the more rapid increase of city population is toward higher prices of milk. Only those who intelligently grow ensilage and soiling crops can continue to compete in producing and selling milk. There is competition enough in this business to crowd out all who will not adopt the most profitable methods. From a wide range of inquiry we are satisfied that as good butter can be made from ensilage feed as from any ordinary ration, not excepting roots. Those who claim that poor butter alone results from feeding ensilage are generally of the class who have had no experience in its use.

From N. E. Homestead.

Corn sowed for ensilage in Vermont was badly injured by the early frosts, but it comes out of the silo in quite good condition, so that cattle eat it greedily. It is evidently worth a great deal more as ensilage than it would be cured in the usual way.



AT A.K. JOHNSTON'S
JERSEY CATTLE FARM, STATEN ISLAND, N.Y.

MR. A. K. JOHNSTON'S CONCRETE SILO.

The silo, of which a half only is shown in the cut, is double, each division being 30x12x16 feet, inside measure; estimated to hold 144 tons of well-preserved ensilage, or 288 tons in all.

It is built entirely above ground at the sides and rear, a bank of perhaps four feet resting against its front. Its wall on the barn side is placed fourteen feet from the barn, by which means two sides of a three-story building 14x33 are gained, the building costing only the roof, two floors, and the narrow ends. The basement gives excellent storage for roots and a mixing floor for feed. The second floor is an engine room and carpenter-shop, with room to run a farm mill-grindstone and stalk and hay-cutter. The third story is a storehouse.

Doors in the middle and barn side walls of the silo, on the level of the feeding-floor of the stable (basement), permit the most convenient removal of the ensilage—on a hand-car—without lifting it over the walls of the silo.

It is drawn at once to the mangers of the cattle, which are arranged on opposite sides of a long aisle. The wooden structure above the concrete walls furnishes room to pile the chopped corn high enough above the masonry to allow it, when settled and the weights applied, to occupy the space enclosed by the solid walls, and room for handling the weights.

Concrete walls are made of many proportions, but General Q. A. Gillmore, who had large experiences with them, advised the use of Portland cement, mixed as follows: 1 barrel Portland cement, 4 barrels clean sharp sand, 6 barrels clean gravel. First, mix the cement and sand together by shovelling them over four times; then let a workman throw a shovelful from this mixture to meet one thrown by another workman from the heap of gravel. Afterwards let them shovel this heap over four times. It is now ready to be wet, but only a small quantity should be wet at once, no more than the men not employed in mixing can carry and deposit in place within five or ten minutes. When they have done this, a new lot should be ready for them. To wet it, take from the dry mixed pile, say two barrels; as two workmen shovel it into a new pile, let a third carefully sprinkle it with a watering pot, having a rose sprinkler attached. They should work it over at least three times, and will probably use some 20 gallons of water in doing it. The mass as deposited should be like a soft pudding or custard, so that the stone put into it shall be surrounded by it on every side and no cavities left about them unfilled as might be the case if the mortar were thick.

If stones are plenty—flat ones are best, but any will do—they can be worked into the wall with a saving of one-third to one-half the cement required.

The walls should be built a month to two months before they are needed, and will be greatly better for such foresight.

The weather should not be frosty, about 60 deg. is right, and it will be best if is not too hot. A strong sun and hot day while the cement is being wet weakens it. All the materials used should be absolutely free from loam, a very little of which will greatly injure the strength of the wall.

The dry mixture of cement, sand and gravel, if protected from the rain and dew, may be left over night; otherwise all mixed must be wet up and used at once, as a rain or heavy dew will spoil it. Stones, when put in the mortar or when it is poured upon them, should have their surfaces well wet with a *sprinkler*, if on the wall, or in any way if by themselves.

If a new wall is to be joined to or built on the old concrete wall, wet the latter copiously, before supplying the new material. The mortar can be deposited much faster from mortar-hods than from boxes or pails.

If you allow one-third of the cubic contents of the wall to be occupied by stone and the remaining two-thirds by concrete, you may estimate that one barrel of Portland cement (400 lbs.) will be needed for each forty-five cubic feet of space, or better say, for each forty feet. The mixture described is eleven barrels, but it will contract about 20 per cent. in mixing. A barrel of Portland cement weighs 400 pounds and measures aboat four bushels, or say five cubic feet.

As an absolutely tight room is not necessary for a silo, it is better to build the silo as an independent building or lean-to, rather than take up valuable needed room in a well-built barn.

OBSERVATIONS CONCERNING SILOS, AND THE METHOD OF CONSTRUCTING THEM.

BY MR. A. K. JOHNSTON.

The size of the silo wanted may be calculated by estimating that one cubic foot of well-compressed ensilage will weigh 50 lbs. Of course, this will vary somewhat, but it is the weight ascertained by the experiment of a careful farmer, and is a very convenient number for ready use. If you feed other material to some extent—as one feed of dry hay or stalks, or grain, bran or meal—50 lbs. of ensilage per day is a fair allowance for each 1,000 lbs. of cattle. If you feed ensilage exclusively, 1¼ cubic feet per day, or 62½ lbs., will be needed.

Suppose, then, you expect to feed two rations per day of ensilage, and that your herd of cattle, young and old together, number fifty, which you estimate equal to forty 1,000 lbs. animals.

If you are located where you will feed the stock for six months or 180 days, you will require for this herd, for one day, 40x50 lbs. = 2,000 lbs., or 40 cubic feet of ensilage; and for 180 days you need storage-room for 180x40 = 7,200 cubic feet. A good proportion for such a silo would be 30 feet long by 20 feet high by 12 feet wide, equal to 7,200 cubic feet.

If sunk in the ground, and the walls supported against solid sides of earth, they may be built of masonry fifteen inches thick; but if, as is much more convenient usually, the silo is put above ground, and with its floor on a level with the feeding-floor of the stable, the walls should not be less than two feet thick, and it would be well to support the long-side walls with abutments at intervals of ten feet.

THE FOURTH ENSILAGE CONGRESS.

Met at 55 Beekman Street, January 21, 1885.

MR. J. B. BROWN, Secretary, called the Congress to order and announced the programme of proceedings. He said: There are already two parties in the field on the question of ensilage. To heat or not to heat, that is the question. I suppose most of the gentlemen present know the object of this meeting, or think they do. It is to make a book. One that will contain a good many facts and many men's experience. There is a modern way of making a book on agriculture, where two men get together and employ a stenographer, to whom they talk about the subject, and their talk makes the book. That makes a very good book, even if one of the gentlemen is a Scotchman, and don't know much about ensilage. [Laughter.] But I think a better way is to get a good many men together who know something about the subject, and let them talk with one another and question one another, and we have a "chiel" here to take the notes and "prent 'em." I suppose you would like to have a President. There is a gentleman present, who, upon a certain occasion twenty-five years ago, said, so that all the country heard it: "My goods are for sale, but not my principles." I will nominate that gentleman, Mr. Henry C. Bowen, proprietor of the New York *Independent*, for your presiding officer.

MR. BOWEN was chosen by acclamation, and, on taking the chair, said: *Gentlemen of the Ensilage Congress*—I was somewhat astonished as well as pleased when I was called upon to preside at this gathering. I was astonished, because I know a great many men who have more knowledge of these matters, which are to be discussed here, than myself. I was pleased because it seemed to me that I might make it profitable to come here. I can congratulate myself that, like my friend Evarts, after twenty-four years' waiting, I have at last got to Congress, and I am made Speaker of the House at the beginning. Although I am not familiar with the topics that are to come before you, I can see that good order is preserved and that no disturbance occurs.

MR. J. B. BROWN—A great many letters have been received. A cablegram, this moment received, from Ellis Lever, Bowdon, Manchester, England, Jan. 21st, 1885, to the Ensilage Congress: "Seven

hundred silos constructed in Great Britain, within two years, testifies to immense value of ensilage here. Royalty, nobility, landlords, and farmers adopting system; few croakers. Agriculturists of old country under great obligations to you and your countrymen for making known, through your Congresses, the advantage of Goffart's discovery. Heaven speed your labors."

MR. N. G. SPRAGUE, of Brandon, Vt.—I came rather to listen than to talk. I have built silos and I think they are good, and the only obstacle to their increase is prejudice, which I hope will be in some measure overcome by this Congress. We know that all agricultural improvements must await their time, and you must expect ensilage to wait a long time before all grasp its beneficial ideas fully.

MR. CHARLES T. CROMWELL, of Rye, N. Y.—I have been experimenting on four cows. I have two silos. I think ensilage has done me good. The first year I tried all sorts of ensilage—Canada peas, corn, rye, sorghum, oats, and put them altogether in one silo. I have come to the conclusion from my experience, that corn is the best ensilage that can be made, and rye follows next. I am decidedly in favor of ensilage. We had a winter silo and a summer silo. When the dry weather dries up everything the summer silo comes in very good. My foreman said to me: "Beets are the best ensilage." But I know better than that. The beet crop robbed the hayfield. I recollect the beet crop with terror. [Laughter.] It destroys absolutely our whole system of working. I find that all cattle love ensilage. They love it as much as a Western man loves whiskey. After the ensilage has become cool, I leave open the upper door, and keep it open, say, from October 15th on, till very freezing weather. The air prevents or keeps off mould and mildew. If the silo is closed the sides and edges of the ensilage become badly mildewed, to the extent of some inches, by means of the close, damp atmosphere. Open at the upper sides—but keep out the rain—and your ensilage is all the better for air. I have but little experience with ensilage, but what I have I am glad to give.

MR. BROWN—I think the most important question is how to make sweet ensilage. I spoke of two views: to heat or not to heat. I have some letters here bearing on that subject.

CHOBHAM, England, January 7, 1885.

Dear Sir:—I have found one uniform reason for failure to obtain good sweet ensilage from clover, viz.: the clover is cut too young, and is consequently too succulent and contains too much water. Clover answers better when just over the blooming state. If cut earlier it should be hayed a little; 75 per cent. of moisture is the limit. If you

get more than this you get a temperature creeping up to 100 deg. F. or perhaps 110 deg. F., and then going back. Of course, this produces sour ensilage. The best practical test of moisture I know, is to take a wisp of the clover (or other crop) in the hands and wring it by twisting; if you see any moisture exuding at the twist, the stuff is too wet and must be allowed to dry until it stands the test. I like to see the temperature run up quickly to 150 deg. F., and it will do this if the clover is sufficiently mature and dry.

I hope you will have a successful meeting.

I may say that among my numerous correspondents who have made "sweet ensilage" according to my instructions, not one has failed, as far as I have been able to ascertain. I am, dear sir, yours truly, GEO. FRY.

Mr. Fry is an eminent authority on ensilage in England, and was the first writer on the advantage of certain heat in the silo to sweeten ensilage, but I think that it does not apply to mature maize stalks. It probably does to very green maize stalks, such as Mr. Bronson used in his experiment with horses. Mr. Fry has probably never seen mature maize juice in England. But I think he has put us on the road to make good clover and grass ensilage every time. Where the stalks are fallen and too green it may be well to wilt them and fill slowly in order to heat.

A letter from the most energetic promoter of ensilage and one of the best farmers and flock-masters of England:

MERTON, NORFOLK, ENGLAND, 22d Dec., 1884.

DEAR SIR:—I send you a copy of my two lectures on ensilage. The latter was delivered before the Prince of Wales and more than one thousand influential ladies, noblemen, and gentlemen in the lecture hall at the South Kensington Hall, London.

There is no difficulty whatever in making good ensilage of clover or any kind of grass. The great point to be observed is to cut the material into chaff before putting it into the silo, and to *ram* and *tread* it as *compactly as possible*, and especially along the sides and ends of the silo.

To avoid the perfect ramming and trampling is to do the very thing that will lead to failure.

If you will read and carefully observe the directions given in my lecture, you need have no fear of making good silage.

Do not overweight the material in the silos. Seventy pounds per square superficial foot surface may be taken as the right and proper amount of pressure, so far as my experience goes. Also use wood doors or lids to lay over the silage in the silos, and if you use three or four inches deep of bran as a covering on the top of the boards you will not regret it.

I was one of the judges at the late successful exhibition of ensilage in London when the fermented material was easily beaten by silage which had not undergone the fermentation process.

I wish I could attend your Ensilage Congress on the 21st January, but that is impossible.

Please let me have a copy of the report of your doings.

Yours faithfully, HENRY WOODS.

S. M. COLCORD, of Dover, Mass., addressed the Congress with particular reference to a method of disposing of "the juice" at the bottom of a silo, and spoke in favor of introducing pipes to carry off the air and "juice," and to prevent the breeding of bacteria through fermentation. But the aggregated experience seemed to echo the remark of

GEORGE GREGORY SMITH, of St. Albans, Vt.: "We never have any 'juice' at all."

It was suggested that whenever the bottom of a silo got filled with "juice" it would be re-absorbed by the contents.

MR. SPRAGUE expressed himself decidedly opposed to any form of silo that deposits "juice," or as he termed it, "extract of corn." He preferred to have his extract spread all through the ensilage.

MR. SLINN, of Spring Valley, Rockland County, New York, gave the Congress a favorable report of his four years' trial of ensilage. He found that a light covering with a pressure of about 150 pounds to the square foot, prevented moulding. He reported that his cows like the ensilage and thrive upon it.

MR. EDWIN ALLEN, of New Brunswick, who has the reputation of making sweet ensilage, said: "I have filled my silo at the rate of about a foot a day. I put in corn, clover, and Canada peas in alternate layers. The temperature never got above 130 deg. while I was putting it in. No juice exuded, and it gave good satisfaction."

JAMES HOYT, of New Canaan, Conn.: "I have filled a silo 30 feet deep, and have fed out of it to within three feet of the bottom, and find it fresh and moist. I hope the reporters will not put down what that gentleman said about the cattle taking to ensilage as men do to whiskey. If that is published a dozen people in our town will be at me when I get home."

COL. WOLCOTT, of Hotel Vendome, Boston—We should get some of these men of experience to stand up here and be cross-questioned.

MR. BROWN—Will Col. Wolcott please stand up?

COL. WOLCOTT—I am too much of an invalid; but I came from Boston to attend the Congress, which attests my continued interest in ensilage. Mr, Reed and I were the first to give exact account of the results of ensilage.

MR. ALFRED A. REED, of Providence, R. I., submitted to be cross-questioned:

Q. Are you still using your silos? A. I am. I have enlarged them. I have one 20x12x14 feet and one 36x16x14. The 14 is the depth.

Q. What crops? A. Corn entirely.

Q. Do you get sweet ensilage? A. Well, that depends upon what you call sweet. I get it as sweet as any I smell here. I tried an experiment to get sweet ensilage. I packed the silo from the bottom to the top, filling in the ensilage very slowly, and taking the heat carefully three times a day. I had two thermometers, and by the aid of my apparatus I found that the temperature was 94 deg. Some gentlemen say they run the heat up to 130. That may be correct. It depends upon conditions of the ensilage when you put it in. If you have corn that is immature and full of moisture, I have no question that the heat will run up to 130 deg. But, if the corn contains a large percentage of saccharine matter, I do not think you can run it up to 130—at least I could not do it. One time I did not open it for two weeks. I was bound to get it up to 130, but it was impossible.

Q. What was the state of the corn as to ripeness? A. The corn tassel was comparatively dry. The corn itself was too mature to eat as green corn. It had comparatively very little "juice" in it, but in running it through the cutter it was damp, so that moisture would come out of it.

Q. Was there any "juice" coming out of the bottom of the silo? A. I have never had that experience. I do not think that people would find moisture or "juice" running out of their silos unless it was also running in from the outside.

Q. Give us the facts exactly—state what you did. Take corn? A. The first year that I tried it was in 1881. I was forced to do it on account of a short crop. I first put in the corn green. Since then I have put it into the silo later and later, and I find it better this year than ever before.

Q. What kind of corn? A. White Southern corn.

Q. And what temperature did you get? A. There were some fluctuations. Practically, 94 deg.

Q. At what time? A. Four days after it was put in.

Q. Was there any difference in the silo filled quickly and the one filled in two weeks? A. I do not think anybody could tell the difference—certainly I could not.

Q. Do you make milk? A. No; I make butter for customers who are as exacting as anybody.

Q. How do you feed? A. I feed ensilage three times a day, with 15 pounds at a feed. I feed during the day six quarts made into three feeds, consisting of two-thirds bran and one-third meal.

Q. Was all the ensilage good? A. About two inches waste on top. I have tried all sorts of covering—oak leaves, tar paper, hay, etc.—but have never been successful in saving my ensilage right up to the edge.

Q. What do you consider the value of ensilage as food? A. I think a ton of ensilage is worth, for sustaining life, about a ton and a third of hay; but, if I were using it as a milkman, I should estimate it much higher.

Q. How much? A. It would be considerable guess-work.

Q. Did you ever feed ensilage to horses? A. No.

Q. Why not? A. Because mine are driving horses, and I do not believe their speed would be benefitted by such feed. They require stimulating food.

The following is the exact cost of my ensilage for 1884 :

Fertilizers, 58½ bags, @ $4.80		$280.80
Manure, 6 cords, @ $4.00		24.00
Plowing, 32½ days, @ $2.25 per day		73.13
Harrowing and Rolling, 9 days, @ $2.25 per day		20.25
Labor in Picking Stones and Planting, 18½ days, @ $1.25		23.13
Planting, 1 horse and man, 4¾ days, @ $2.25		10.69
Cultivating, 1 horse and man, 7½ days, @ $2.25		16.88
Hoeing, 71½ days, @ $1.25		89.38
Seed Corn, 20¼ bushels, @ $1.00		20.25
		$558.51
Drawing Corn from lots, 38 teams, @ $1.50	$57.00	
Labor Cutting in Field, and Silo, 152½ days, @ at $1.25	190.63	
1½ tons Coal, at $4.75, for Engine	7.13	254.76
		$813.27

Amount of Ensilage packed, 234 $\frac{1775}{1000}$ tons, or 234.88 tons; cost per ton, $3.46.

Mr. Richard M. Hoe, of New York—I put in apples with the corn. Two weeks ago I opened it and they came out dry. It seemed to me like canned fruit without the tin all around it.

Mr. Reed—Now I want to ask a question. I want to know how much has been got out of an acre. I am going to try an experiment of that kind, and I want to know what has been done. I do not mean guesses. I have tried that and have given it up. I mean weight and measurement.

Thomas Galbraith, of Mr. Lorillard's farm, Jobstown, N. J.—I can give you the figures of 53 acres. The total cost of planting and raising corn was $37.65; cost of harvesting, $2.50 per ton. Three silos were

filled, containing 1,200 tons. The highest yield per acre was 27½ tons; the average per acre was 23 tons. The amount cut was 60 tons per day, with 44 men and 7 teams. We use five silos. Don't have any "juice" at the bottom of the silo.

Q. Do you feed it to horses? No.

Q. How many days from the time of planting was the corn cut? A. It was planted May 12, and we began cutting in September, continuing two or three weeks.

MR. ALBERT A. DRAKE—I have been an amateur farmer for 17 years. I put away 6 to 7 acres of maize, about 80 tons, which I consider equal to 40 tons good hay. It costs me less than a dollar per ton ready to use. I fed ensilage to horses, and lost 5 out of 7. The disease resembled spinal meningitis. I suppose they died from eating the ensilage.

Q. Was it corn ensilage? A. Yes. If ensilage milk is so bad and so unhealthy I think there ought to be some proof shown. I see there are a good many farmers selling milk for 2½ and 3½ cents a quart. I do not know how they can afford it. My experience is that I fed too much ensilage at first. I gave the cattle all they could eat. But I have learned better. I feed cattle like I feed myself. I don't eat too much, but I eat enough. I give the cattle as much as they can relish. The stock is doing well and gives good milk. I feed other things with the ensilage—meal, etc.

Committees were appointed by vote of the Congress to report on samples of ensilage butter and ensilage.

The Committee on Butter report that all the samples submitted for inspection are very fine, and that those samples furnished by Messrs. A. A. Reed, of Providence, R. I., and J. Gregory Smith, of Vermont, deserve special mention.

LOUIS BRUSH, North Manchester, Conn.
ARTHUR S. CORE, Valhalla, N. Y.
A. S. HEATH, M.D., 245 E. 71st St., N.Y. City.

An elegant sample of Holstein Ensilage butter was presented by Smiths & Powell, of Syracuse, N. Y., but too late for committee to pass upon. The Holstein herd of this firm is probably the finest and largest in the world, comprising about 600 head—imported and bred. They feed large quantities of ensilage.

The Committee on Ensilage, Messrs. A. A. Reed, W. W. Merriam and Edwin Allen, reported that all the samples were corn ensilage; that they

had found no "sweet ensilage;" that the best was from Renne Martin, and the next from P. McEvoy, of Trenton, N. J., and special mention was deserved by the samples from D. J. Garth, of Scarsdale, N. Y.; C. M. Calhoun, of Bridgeport, Conn., and Hon. J. Gregory Smith, of St. Albans, Vt.

The gentlemen who had made the best and second-best ensilage were invited to explain their methods.

PATRICK McEVOY, of Trenton, N. J., was called upon to address the Congress, upon the announcement that the committee had commended his specimen of ensilage, and the Congress had enjoyed his can of ensilage milk. He gave the Congress a description of his silo and his method of filling and weighting. Then he said he was ready to answer questions. The Congress was quite ready to ask them, and some of them were as follows:

Q. Do you ever have juice at the bottom of the silo? A. Oh, yes, a little, say a scoop-shovel full.

Q. How long are you in filling your silo? A. Three or four days, taking one after the other. I have put in 100 tons in a day.

Q. Do you tramp it? A. Yes, sir, and keep it from bunching in the middle of the silo.

Q. Do you ever put it in wet? A. Wet or dry. I put it in as quick as possible.

Q. Was this specimen you have brought here put in wet? A. I could not say, but there has been ensilage put in the silo that has been taken out wet.

Q. Put in, in wet weather? A. In wet weather.

Q. How would that affect it? A. I paid no attention to it. When I start a field I work as long as the men can stand out.

Q. Rain or shine? A. Yes, sir.

Q. Was there any mouldy layers in it? A. None, except along the edge. There was, perhaps, about two bushels spoiled.

Q. Did you put tar covering on it? A. No, sir.

Q. Did you take the temperature? A. I did not think it necessary to look at the temperature for I had not much time.

Q. You have always used a quick process, as quick as you can? A. Yes.

Q. Well, scientific men say that is not right? A. Well, I have too much expense to pay help, to fill only a foot a day.

Q. At what stage of the growth of the corn do you cut it? A. When

the silk is just nicely out, and once in a while on the stalk you find a nice roasting ear.

Q. How many tons to the acre? A. Well, I cut 25 tons from the best piece I ever raised. I do not know whether I could raise any more. I have heard of 75 tons raised on an acre, but I cannot believe it.

Q. Did you weigh the 25 tons? A. They weighed it.

Q. And actually measured the acre? A. Measured the acre and weighed the corn.

Q. What sort of a machine can you get to cut 100 tons a day? A. I use a 48-inch Cyclone cutter with elevator.

Q. When did you take this sample out of the ensilage? A. This morning.

Q. Is yours a stone silo? A. It is not. It is a mason structure, of brick and Portland cement and river sand—a 13-inch wall.

Q. What was the amount of weight you used? A. One hundred to one hundred and twenty-five pounds to the square foot.

Q. Do you make butter or sell milk? A. I sell milk.

Q. Have constant custom? A. I have.

Q. Do you feed ensilage before or after milking? A. After milking. I never feed before milking, for the reason that it would spoil cows.

Q. Any dry food? A. Part of the time I feed dried corn stalks to all the cows, which I cut fine and steam with feed and mix thoroughly.

Q. Do you take some trouble to steam it? A. Yes, sir.

Q. Which do you prize most, dry feed or ensilage? A. Oh, ensilage by all means.

Q. How much ensilage do you feed a day? A. I feed all a cow will eat nice and clean. The closest that I can guess, say 50 or 60 pounds.

Q. What do you estimate is the cost of feeding one cow per day? A. Well, 23 cents a day will give a cow proper food and keep her in good order.

Q. Can you give the exact cost of ensilage in the silo? A. Well, after I have cut 80 tons a day I do not have much leisure time to go into that.

Q. What power do you use with your cutter? A. Steam power. Fifteen horse-power.

Q. How many men at work to cut 80 tons a day? A. From 11 to 14 men. Generally one or two men would drop out before we got through. I like to keep one or two men in reserve.

Q. When you got 25 tons to the acre how far apart have your rows been? A. I had the drills just 28 inches apart, and from 12 to 15 kernels to a running foot.

Q. How did you prepare the ground? A. I had clover sod and covered it heavily with barn-yard manure.

Q. How much did you sow to the acre? A. About 2½ to 3 bushels.

Q. Always have clover sod? A. When I got 25 tons to the acre I did.

Q. Did you use anything else to put on the ground? A. Yes. I put in fertilizers with the corn.

Q. How much to the acre? A. About 400 pounds.

Q. What fertilizer? A. Well, I do most with Swiftsure.

Q. What is that? A. Well, there is plenty of it in Philadelphia.

Q. How does it spoil a cow to feed her before milking? A. Well, if you feed her before milking—sometimes you will want to milk her before feeding, and then you will find out that she wants you to feed her before you milk her.

Q. How much do you get a quart for your milk? A. From 6 to 8 cents.

Q. Do you think it more important to milk regularly than to feed regularly? A. If you don't feed regularly I do not think you can milk regularly.

Q. How long do you keep the ensilage out before feeding? A. About 12 hours.

Q. How much does your ensilage cost per ton? A. As close as I could get to it about $1.75 a ton in the silo.

Q. How many times do you feed your cows? A. Three times a day.

Q. Equal proportions every time? A. About equal.

Q. Don't give any hay at all! A. No.

Q. What difference do you find between feeding immediately on taking it out, or letting it lie 12 hours? A. I do not think the cows relish it as well. It would not be quite as hot. Chemical men have told me I should leave it out.

Q. Did you ever put salt in your silo? A. Never.

Q. What would be the effect of leaving ensilage out 24 hours, after you take it from the silo, before feeding? A. I do not see that it makes any difference.

Q. How many years have you been using ensilage? A. This is the fifth year.

Q. How many more head of cattle do you carry on your land than you did before? A. From sixteen to twenty head was as many as I could carry. I now carry 67 head and I think the same farm can be made to carry 100.

Q. What do you buy to feed your cows? A. I buy some corn meal, a great deal of bran, and some cotton seed meal.

Q. How many acres in your farm? A. 133.

Q. Do you feed cotton seed meal every day? A. Yes.

Q. What proportion? A. Well, I feed about 2 quarts of corn meal and about a pint or a pint and a half of cotton seed to a cow, and the remainder bran—about 10 quarts each per day.

Q. What kind of cows have you? A. I have some Durhams, some Jerseys, and a great many crossed.

Q. Do you breed cows? A. Yes, sir.

Q. Do your cows calve all right? A. Yes, sir.

Q. Do you think ensilage is good food? A. I get as much out of 16 cows with ensilage as I would out of 60 without it.

Q. Did you ever feed ensilage to horses? A. Never.

Q. Do you feed ensilage all the year round? A. I feed it just as long as I have it. I have not had it all the year round.

Q. How many quarts of milk do your cows average? A. They average 6½ to 7 quarts a day.

Mr. McEvoy submitted the detailed cost of his ensilage—360 tons from 18 acres:

Plowing, at $1 50 an acre	$ 27 00
Seed, 3 bushels to the acre, 54 bushels at 80c	43 20
Planting with drill, 3 rows at a time	11 00
6 loads Barnyard Manure to the acre, 108 at $1	108 00
400 lbs. Fertilizers to an acre, at $40 per ton	144 00
Cultivating, two workings	19 50
Cutting and putting in silo, 33c. a ton	118 80
Total cost of 360 tons	$471 50

One quarter of charge for manure and fertilizer should be deducted, because it would be available for another crop. This would reduce the cost per ton to $1 14.

8 men besides himself and three teams cut with a 48-inch Cyclone cutter 70 tons a day.

Mr. Renne Martin, South Orange, N. J.—We built no silo. We use as a silo what was formerly a cider cellar. It makes a good substitute for a silo. I have not seen any juice in it. We filled our silo in September and left it four days. There was considerable heat, and it ran up to 130 degrees, down by the foot of the silo, and before we covered it up I noticed that it began to spoil a little on top, and in one spot it began to get mouldy a little. I was afraid we were going to have a lot of spoiled ensi-

lage. But there was only a little spoiled on top; the rest was good. I could not help it spoiling about four inches from the doorway. With regard to feeding, I have fed both before and after milking. I can't say that I observed any difference. We take out the ensilage and let it stand in the box; sometimes it stands from night until the next morning.

Q. How much do you feed? A. About 50 or 60 pounds of ensilage a day to a cow.

Q. Anything else with it? A. Yes, corn meal, bran—anything they will relish.

Q. You ensilage only corn? A. Only corn.

Q. Do you raise cattle? A. Yes, for dairy purposes, for milking. I raise some pretty nice Jersey stock.

Q. Do you sell milk? A. Yes.

Q. What do you get a quart? A. Eight cents; some wholesale at five cents.

Q. Have you had it tested with the lactometer? A. No, sir. My customers are my lactometer; they want good milk. My ten cows give eighty-five quarts a day.

Q. Don't you think it injures the milk? A. I cannot perceive any injury.

Q. Do you see any difference in the milk between ensilage and dry feed? A. I cannot say I do.

Q. Would not one acre of corn ensilage be of more value than one acre of dry fodder? A. I think it would. I think one acre of ensilage would go as far as two of fodder—I mean dry fodder.

DR. T. S. LAMBERT, of New York, explained the analyses as follows:

Gentlemen of the Ensilage Congress:

I have been requested to explain the tables attached to the curtain before you. My task is a very simple one, since the tables tell their own story for the most part. Here is a parallel analysis of grass ensilage June 14, and the same when taken from silo July 14th:

	Grass.	*Ensilage.*
Water	64.45	63.10
Fat	1.11	1.29
Albuminoids (gluten, legumen, etc.)	3.01	4.412
Fibre (cellulose)	26.99	20.788
Soluble carbo-hydrates (dextrose, sucrose, glucose, etc.)	2.32	7.35
Ash (salts, phosphates, silicates, carbonates, etc.)	2.12	2.82
Lactic acid		.24
	100.00	100.00

This analysis is made by Thomas P. Blunt, M.A., of England, for Mr. H. Kains Jackson, the originator of the great exhibition of ensilage at the Smithfield Cattle Show.

The chemist remarks: "There is a slight loss of water by the ensilage and an increase in fat and ash.

"The facts of a decrease of six per cent. of fibre in the ensilage, and an increase of nearly the same amount, namely, five per cent. of the soluble carbo-hydrates, are of paramount interest. There can be no doubt that this result is due to the ensilaging of the grasses, of which, therefore, it is difficult to exaggerate the value.

"Few questions in regard to ensilage have been more discussed than the effect of the process upon its comparative food value. Here we have a decisive answer: That ensilage has undoubtedly a higher value as a fat-former than has a corresponding weight of grass when placed in the silo.

"The other differences are too slight to affect the character of the ensilage as a food except, perhaps, by giving it a better relish, an important point."

I wish to say, in this connection, that the pure chemist, uncombined with the physiologist, is very apt to overlook the true value of ensilaging fodder, and to attribute it, as in this case, to its producing certain changes merely.

Those who were present at the first Ensilage Congress will remember that I then spoke of the process going on in the silo as a partial digestive process, and that I laid stress upon the fact that there was no vinous or alcoholic smell arising from good ensilage, that its smell was almost peculiar to itself, and very similar to the smell of the newly opened paunch of the healthy cow that has been feeding upon wholesome food. Besides, I had endeavoured in vain to find any alcohol in all, some half a dozen, specimens of ensilage tested, which had also refused to yield acetic or any other than lactic acid. If either alcohol or acetic acid is ever found in ensilage, I was then, and am now still more persuaded that the article in which either is found is not good ensilage nor fit to be presented as food before any respectable cow.

That ensilaging is a process of partial digestion I will fortify by the testimony of the ex-President of the Farmers' Club of this city, who is with us to-day, I mean Dr. A. S. Heath, whom I have often heard speak upon this subject; and certainly no one is more learned upon all that concerns cattle, both their insides and outsides, and history. I am proud to find myself sustained by him.

The second Table before you is taken from REPORT OF U. S. LABORATORY. Analysis of milk from cows fed upon brewers' grains and hay:

Water	87.25
Fat	3.15
Sugar of Milk	3.80
Caseine	5.00
Ash	0.80
Total Solids, 12.75.	100.00

The third Table is from the same Report. Milk of cows fed upon ensilage, bran and cotton-seed meal:

Water	86.14
Fat	4.14
Sugar of milk	5.46
Caseine	3.54
Ash	0.72
Total Solids, 13.86.	100.00

It is evident that the latter milk is much the most wholesome, for which credit must be given to the ENSILAGE used; though the cheese maker might think that the former would be more profitable to him. But cheese made from it would not be as rich—more like skim-milk cheese—and would not get the best price that cheese made from the milk of the latter Table would readily find.

The average of one hundred analyses of the milk of different cows, of different breeds is: water, 86.3; fat, 3.7; sugar, 5.1; caseine, 4.1; ash, 0.8. But every one present knows that there are numerous circumstances that vary the proportions mentioned. Farmers are usually most anxious about the conditions that vary the fat, the chief cause of which seems to be found in the inheritance, namely in the breed, the Jersey being most famous. Those who furnish the market with milk care most for the quantity, while the cheese interest regards the caseine as the choice part of the milk. It fortunately happens that in all these respects the food ensilaged profiteth the farmer much, while if he wishes to fatten his stock a goodly portion of ensilage will aid him in profitably attaining the desired end.

It may not be amiss to compare the caseine of the cow's milk, 4.1, with that of human milk, 1.6, or one-third that of cow's. Hence why, if the latter is fed to infants it must be very much diluted with water, and then enriched by the addition of sugar (milk sugar preferable) and cream. Many children die in hot weather for want of a proper dilution of the cow's milk fed to them, and because a sufficient quantity of water as a drink is withheld from them. Thousands of infants' lives would be saved if the cows' milk was diluted twice and one-half, and the sugar and cream added, and water blood-warm also given as drink, for which infants often cry, when it is supposed that they are hungry.

The Congress adopted the following Resolution, without a dissenting voice:

Resolved, That the observations carefully made of the system of ensilage and the experience gained in its practice during the past year have served to deepen our confidence in its merits, and have demonstrated that it furnishes more economical food than can be obtained under any other system, and at the same time one that is perfectly healthful both to the animal and the product.

Mr. KNAPP called up the report of the committee appointed at the last Congress to ascertain the facts with reference to the action of the Borden Condensed Milk Company. He said it was important that the evidence should be given at once as to whether there was any real foundation for Mr. Borden's fears.

H. H. BROWN, of Winterton, N. Y.—I believe some progress has been made. I have been told that there is a condensed milk factory at Middletown, N. Y., that has had about the same trouble that the Borden factory complained of, and which they attributed to ensilage food, and yet the Middletown concern never used ensilage milk. The Anglo-Swiss Condensed Milk Company are making a thorough test of the matter in Europe, and we may have some interesting testimony in time for the published proceedings of this meeting.

EDWARD GRIDLEY, of Wassaic, N. Y.—What we want is a thorough investigation of this matter. The way to do it is to get evidence to overcome the lack of confidence of the milk-condensing company. So far as I know, the ensilage milk was condemned without any reason being assigned. I suggest that we use the English pronunciation, and call silo—*sylo.*

DR. HARLAN, of Wilmington, Del.—It occurs to me that you want to find out the exact condition that it is best for the corn to be in when you put it in the silo, in order to have it keep best. It may be that it is not best to put it in until the saccharine condition is established. I remember that 40 years ago we had a similar trouble in making sugar out of corn. We could make a syrup, but we could not make sugar. We found out finally that we had been cutting the corn at the wrong time. I think that by careful observation you will find that there is a time to cut your ensilage that will avoid the tendency to sourness, of which complaint is made.

The Congress adjourned to meet at Delmonico's in the evening.

The first dinner of the Ensilage Congress was eaten at Delmonico's on the evening of Jan. 21st, by about 35 farmers. After the coffee an interesting address was delivered by MR. A. W. COLE, of Wellsville, N. Y., descriptive of the efforts that he made in connection with Fred. Douglass, in founding the Republican party. He stated that he edited the Genesee *Free Press*, the first newspaper that came out for that party, and that announced the Republican nominations. MR. J. Y. SMITH gave a pleasant description how he came to be a farmer after having learned his trade of locomotive engineer from George Stephenson, in England, and how profitable he had found his farming to be as the result of the ensilage system which he had extensively used.

The following address was then delivered by DR. T. S. LAMBERT, of New York City, on the "Physiological Advantage of Ensilage." (See Appendix.)

SECOND DAY.

DR. C. HARLAN, of Wilmington, Del., addressed the Congress on the subject of Green Manuring. He began by showing how plants and animals receive nourishment fromgases. He said: Four-fifths of the atmosphere is nitrogen which the Creator did not create for nothing. Every atom is for some purpose. Sixteen per cent. of our flesh is nitrogen. Oxygen enters the lungs for the purpose of purifying the blood. How do

we receive nitrogen? We get it through organic food. There is not a seed or vegetable but organizes nitrogen to be the food of man. Liebig found that there is a wonderful affinity between water and ammonia. "Then," said he, "if there is ammonia in the air it must be in contact with moisture; it must come down in rain and dew to the soil, and by analyzing rain water we can determine whether there is ammonia in the air." Acting on this hypothesis Liebig did analyze the rain and found ammonia every time. But here a stumbling block of a wonderful kind occurred. When about to prepare his great work called "Chemistry Applied to Agriculture and Physiology," he did not wait to see whether his conjecture was correct as to ammonia. Strangely enough, he began his great work with an "If." The able chemist began in this way: "If a pound of rain water contains one quarter of a grain of ammonia, then a field of 26,910 square feet receives annually upwards of 88 pounds of ammonia." Now a field of that size is about two-thirds of an acre, so we would get about a hundred pounds of ammonia to the acre, which is about what is required; and Liebig came to the conclusion and declared positively that there is sufficient ammonia in the air for all that plants require. What was his next conclusion? He said that if you put on minerals, put on phosphates of lime, nature would furnish an abundance of ammonia; that the plants would absorb it with leaves; that rains and dews would bring it to the soil; that plants would absorb it through the roots. We were to have a new system of farming. He came out with a physiological work called "Familiar Letters in Chemistry." He took the ground that ashes represent the whole nourishment which plants receive from the soil; that it is a waste of time and money to buy salts of ammonia to put on your land. "Why," said he, "let us burn fibre and liquid manures, and spread them over your field, and you will have just as large a crop as if you put them on in the natural way." Well, that appeared very reasonable. I remember, when I read his works, I could say, as many had, "Almost thou persuadest me to be a believer in the mineral theory."

I knew a young man, of decided ability and education, who had read Liebig's book, who went right off and bought a farm within sight of my home; and this farm happened to have a tremendous fine barn-yard full of manure. He hauled it all out, and put it on his field, where he used to plant corn, and burned piles of manure—forty or fifty wagon loads of manure—burned it all into ashes, planted corn, and each hill received a nice little dust of the ashes of manure. Fortunately, it happened not to

go over all the field. I visited him several times, and observed the part that received the manure coming up. I observed that there was very little difference between the part that had received the ashes, and that which had received no ashes at all. In England a man had 12 or 15 acres of April wheat in crop. He cut it and stacked it in one corner of the field. Before he had time to take it in, some incendiary applied a match to it and burned it up. Now this man had heard of Liebig's theory, so he took all the ashes and put it on half an acre of ground, thus concentrating all the mineral substance growing out of 12 or 15 acres of ground into half an acre. If Liebig was correct, he had a right to expect a tremendous crop ; but, in fact, there was no perceptible superiority over the rest of the field planted at the same time without ashes.

Scientific men, chemists, in Prussia, in England, and in our country, after carefully catching the rains and dews, and analyzing them, they found only 7½ pounds of ammonia to the acre. That was very different to 88½ pounds to two-thirds of an acre. You will understand that there is always some variation in the result of an analysis, on account of the difference in moisture, the moist air containing more ammonia. The average was 8¾ pounds of ammonia to the acre. Now look at what Liebig said in the face of these facts! He said: "We cannot increase the fertility of our fields by a supply of nitrogen or by salts of ammonia; their products increase or diminish in direct ratio to the supply of mineral elements capable of assimilation." How did he know that? Had he been a practical farmer? No. He claims that he has demonstrated scientifically that what he says is true. Now let us see what happened.

Lawes and Gilbert, in England, made a series of practical experiments in agriculture that entitle them to the gratitude of every farmer, and every lover of humanity in the world. They took a farm, they measured it off carefully; they took one acre and kept planting, but never put a pound of manure on it. They said, "We will see which gives out first, the air or the soil." Then they took another acre and said, "During our lifetime this shall have on it every year the ashes of 14 tons of wheat straw. This will enable us to try Liebig's theory of all mineral nourishment." Then, of another acre they said, "This shall have not only minerals, but nitrate of ammonia." On still another acre they agreed to try 14 tons of barn-yard manure every year. Well, now, what was the result? On the acre that was never manured for thirty years they got 16½ bushels of wheat. Sometimes, if the season was favorable they got a little more, but generally for thirty years they got 16½ bushels a year without putting anything on the land.

Well, how about the ashes? The result of their trial of Liebig's theory was that for this 14 tons of wheat-straw ashes they got just two bushels more a year than they did without anything on the land.

Now, what happened when they tried the salts of ammonia? The product only ran up about five bushels to the acre.

But what happened to the acre on which they put 14 tons of barn-yard manure? Why, they got about 34 bushels per acre! That is easily explained, because the nitrogen and ammonia were in available form in the manure for the land to absorb them.

Yet, how were the men who made these experiments treated by Liebig? It seems incredible that a scientific man could be so unjust. He said of them: "The experiments of Lawes and Gilbert are very far indeed from establishing the conclusions that they wish to draw. They established rather the fact that these gentlemen have not the slightest notion of what is meant by argument or proof." When I read that, I made up my mind that the great chemist was a supremely selfish man. How different was the answer of Dr. Johnson, the great lexicographer, when asked by a lady with reference to a mistake that had been made in his dictionary in the definition of a common word. The lady was disposed to believe that the Doctor had some occult meaning in his definition; but, with admirable frankness, he replied: "It was pure ignorance, madam—pure ignorance." It seems as though Liebig, like the great Napoleon, did not know when he was beaten, and was ashamed to acknowledge that he was wrong when he claimed that there is in the air all the ammonia that plants require.

The latest researches of chemists show that the ammonia in the natural supply of the air is of very trifling importance to vegetation, and that the nitrates are the chief means of furnishing all the nitrogen that crops require. The ammonia is good, but you must concentrate it. What greater proof of that do we need than the use to which the Guano Islands have been put? Here were millions upon millions of tons that have been used to fructify the earth. Guano is merely concentrated ammonia, ready to be taken up by the plants in the fields. But, even some of the great guano fields have been exhausted, as you see by the sand that often comes mixed with it, showing that the bottom of the deposit has been reached; and farmers have been compelled to look about for something else.

Many scientific and practical men have testified that nitrate of soda is a good thing for the land. I tried it once with the idea of surprising my

neighbors with a great crop. I got three tons, at $90 a ton, and put it on a field alongside of another field that I treated merely to barnyard manure. Well, I got but seven or eight bushels an acre more from the land where I used the nitrate. When I came to know the truth about it I said to myself: "I am not going to pay $90 a ton for nitrate of soda when I can manufacture it on my farm for a mere trifle of cost." The statistics show that farmers are losing confidence in it. It does very well to be mixed a little with manure, but, by itself, it is very expensive.

Now I am to talk to you about green manure. I am coming around to it, because I say that nitrogen is the foundation of success on the farm. I told you that nitric acid, whether you call it nitrate of soda or anything else, is the active principle. It is the great reliance of the farmer. It is the very best part of the river water that makes the land rich. It is not the soil deposit of the Nile, but the component parts of the water itself that enrich the land. It has been found that the Nile deposited only an average of one-twentieth of an inch of soil a year for a century. But its waters brought down immense quantities of nitric acid to enrich the land.

Now, what is the condition that is necessary to manufacture nitrogen? It is necessary to cover the ground and keep it moist, and protect it from evaporation. Cover the soil and keep it moist. That is the condition of the ground in the sources of the Nile. The mass of tropical vegetation protects the soil from the burning sun. The nitrogen of the air is thus all the time being converted into nitric acid, and that accounts for the immense amount of nitric acid that comes down with the rivers. Now we are agreed as to this fact, that nitric acid is what we want, and that concentrated ammonia is just as good.

Now there was a farmer once who left an old door lying in his field for a considerable time, and, after that door was taken away it was noticed for several years that the crop was more luxurant at that spot. It could be seen from a distance that something had been done to improve the spot where the door had lain. Now, what had occurred there? It was not the rotting of the old wood. It was simply the fact that the moisture had been retained and evaporation prevented. No matter what the covering is, it may be a board or bag, or green stalks, no matter what, after a time it makes the land exceedingly fertile. One experiment showed that by the method of covering the land with straw, one acre produced 5,870 pounds, while a similar acre alongside of it, not treated in that way produced but 2,207 pounds. Another test produced 3,460 pounds

from the land that was covered, and only 970 from that not covered. Ought not that to convince any person that you ought not to tear the ground naked and leave it exposed to the burning sun?

A chemist once tried this experiment. He analyzed the snow that fell on a stone flagging, and part of the same snowfall that fell on the garden, and lay there 36 hours. He found ten times more ammonia in the snow that had lain on the garden. That proves the truth of the familiar proverb that "snow is the poor man's manure." It arrests the escaping ammonia and preserves it for restoration to the land.

This brings up another question. Where will you place your manure? Some say it must be turned in as soon as possible. I do not think so. The best authority I can find is in favor of spreading the dry manure on the top of the land and letting it lie there to be gradually absorbed by the land.

Now, as to the value of water: It seems to me that people do not realize its immense benefits. It has been ascertained that an acre of wheat, in 5 months and 18 days evaporated through its leaves 355½ tons of water. That is a very remarkable thing. Clover in 101 days evaporated 430 tons of water to an acre.

Now, remember that if you plough that acre of clover in you are giving your land the benefit of a good deal, if not all, of that moisture, and that supplies the key to the problem of green manuring. Ten years ago I compiled a table showing the nitrogen in green crops that we generally use, in comparison with other fertilizers:

Millet in blossom	20	pounds	of	nitrogen	to the ton.
Green clover	12	"	"	"	"
Green rye	11	"	"	"	"
Barn-yard manure	10	"	"	"	"
Green buckwheat	8	"	"	"	"
Green corn	6	"	"	"	"
Green turnip	4	"	"	"	"

DR. HARLAN described at considerable length the process of using the various crops for green manures, showing, by actual experiment, remarkable success in raising large crops by the use of green manures. He stated that in 20 acres of Hungarian millet, costing $60, there is as much nitrogen as in 1,000 tons of stable manure. One ton of green clover contains 12 pounds nitrogen, 2½ pounds of phosphoric acid, 9 pounds potash. We can have by the middle of June, 15 tons to cut down and plough in for wheat, or, if left on the surface a second crop will grow up,

and the two together, roots and tops, by August 15, will amount to 25 tons per acre. Seed at $10 per bushel makes the nitrogen cost less than one cent per pound, and the green clover 10 cents per ton, and it will take 600 tons of barn-yard manure to furnish as much nitrogen as in 20 acres of clover.

It is cheaper to manure with clover than with manure out of your neighbor's barn-yard. Clover is the sheet anchor of the farmer.

Green buckwheat stands very high. One ton of green buckwheat contains 8 lbs. of nitrogen, 3 lbs. phosphoric acid, 11 lbs. of potash. In 1875 I raised in 51 days 27 tons per acre. It was sown July 14, and cut and weighed Sept. 3. Farmers say it poisons the land. So does a check on the bank when it removes your deposit. But plow the money into bank, and it will antidote all the poison. No person ever made money by raising small crops of wheat. You can plow in three or four green crops in one year. In July plow and sow rye and buckwheat together. When the latter is in blossom, cut it down in the rye. The buckwheat acts as a mulch for the rye, and both together protect and improve the soil. By May 15 the rye will be in blossom and should be cut down, and a second will spring up, and in six or eight weeks may be as large as the first; then plow all in together, and by 1st of August put in sowed corn or buckwheat as a mulch for wheat.

Buckwheat is also an excellent mulch for clover, and insures good crops when sown with it in the spring. Cut it down when in blossom.

The covering of land by seashore with seaweed benefits it very much. The wise concentration of fertilization will double the size of your farm, if one acre will yield as much as two before. By green manuring, and by the folding and soiling of animals, we accomplish the great desideratum, —the concentration of plant food, which will always insure success.

The Congress unanimously passed a vote of thanks to Dr. Harlan for his address.

A vote was then taken as to whether it is better to plow in manure or to leave it on top. Of those voting, 32 to 5 were in favor of top-dressing.

Dr. Harlan's work on "Farming with Green Manures," 269 pages, may be had from The New York Plow Company, for $1.00.

Mr. A. N. Cole, of Wellsville, N. Y., addressed the Congress on the subject of Subterranean Irrigation and Perfect Drainage. After referring to many noted personages who had understood and appreciated his great claims, for which he had finally been allowed a patent, he explained the matter, as nearly as is possible for the editor to state it, as follows:

My attention was first directed to this matter by observing the great advantages of a moist soil in hot weather in California, where certain lands were all baked dry, and certain others which had been ascertained to have subterranean streams were producing great crops. I was also led by the fact of the growing of the grand wheat in Dakota on frost that is ten feet or more in depth, and which, by its gradual thawing, supplies the wheat with moisture. I was led to believe that all land might be so watered, and that subterranean currents might be made to flow in all lands with hard pan or firm subsoil, and thereby make an end of the desert over an area of millions of acres of public lands that are now utterly worthless, converting them into those as rich as the most fertile of the earth.

This system, so perfect in action and wonderful in results, is one so simple in principle and construction that the speaker finds it is a matter of difficulty to give an intelligent description of it. The land upon which I have so far applied the system consists of flat and a gentle hillside slope, behind it. Beginning at the front of the plot, I sink a trench through the soil, and into the sub-soil about three feet, keeping a water level. Into the bottom of this trench is placed large stones in such a number as to leave all the water space possible; these large stones are brought up to within about six inches or less of the top of the sub-soil; over these are then put the small stones taken from the land, and these are then topped off with straw, leaves, or cut weeds. These are put on as a protection against the washing down of the soil into the trenches. Over this mat the surface soil is again replaced, to such a depth that neither plow nor fork shall interfere with the arrangement of the trench. Going above this trench three rods or more on the slope, I sink another trench in the same way, parallel with the first, and finished off in the same manner. *Between* the two is then put a connecting trench, for overflow, just far enough below the surface to escape the tools used in the cultivation of the soil, and the bottom of which *shall not* come within two feet or more of the bottom of the trenches. Above this second trench is constructed a third, and so on over the plot or field to be drained and irrigated. With the melting snows and heavy rains of spring, the system of trenches fills, holding water enough to carry the crops through the drouth season. Of course, the deeper, wider, and more numerous the canals the more water stored. The last or lowest trench has an overflow or drainage trench which flows off all surplus water.

The action of the system is this: The water from the melting snow or

all heavy rains filter through the *surface soil* into the trenches ; as one fills, it overflows into another, and so on, consequently not one particle of surplus water can stand upon or in the surface soil. As long as there is sufficient moisture in the soil to meet the wants of the growing vegetation, the water remains in the trenches, but as soon as there is a scarcity, *nature* sets her pumps, natural absorption of the soil, solar evaporation, and capillary attraction at work, and the stored water is brought up, and supplies to the growing plants all the moisture necessary for their perfect development. This *moist* soil is never wet, cold, or heavy.

The cost of this system is no more than that of drainage by tile. In addition to the perfect drainage and irrigation of the lands, I have produced a living stream of pure water where none before existed ; in place of the washing of the lands, the loss of manure by surface wash, etc., *every drop* of water falling upon it is held there, and, in time, appropriated. By making trenches in this way, of any size, with a cold frame *over* them, fruits and vegetables can be grown during every month of the year, at one-fourth the expense it now costs to grow them in hot-houses.

The system is applicable to level lands as well as hillside, the only thing necessary being an outlet for drainage from eighteen inches to two feet lower than the surface of the land. The only requisite beside this is a retentive sub-soil.

During the summer of 1883 I grew, under this system, on one-twentieth of an acre, actual measurement, one hundred and sixty-five dollars' worth of strawberries. These berries all brought twenty-five cents per box, or about one cent each, on account of their great size and beauty.

Mr. Cole stated the enormous size of strawberries, "as large as peaches," also of plums and other fruits grown on this soil ; also of the many crops he could produce in a season, and invited the Congress to visit him July 4th, 1885. The Congress constituted itself a Committee of the Whole for that purpose.

The meeting adjourned till 7 P. M., at Grand Central Hotel, to give the Congress an opportunity to visit the silos and stables of Mr. Wm. Simpson and of Mr. R. M. Hoe, in 23rd Ward, this city.

SECOND DAY—EVENING.

The last session of the Ensilage Congress was held at Grand Central Hotel, on Thursday evening, January 22.

MR. W. H. GILBERT, of Richland, New York, made the following statement: My farm is on a pine ridge, and the soil is sandy and very poor, but it becomes the best kind of farming land when it has been properly handled. I used to hear about sandy soil leaching, but I find that when this soil is rolled it makes the biggest crops. I believe that we lose by evaporation but never by leaching. I have spread manure by machine on same ground, and at same time on top, and harrowed, and plowed in and harrowed; and that which was plowed in made the best crops—could see the color darker. I concluded never again to put manure in with a harrow, as a large quantity must evaporate. When I heap up manure I always cover it with gypsum. It is the sun and not the rain that injures a pile of manure. In drying it may make fuel for the stove but not for the crop. I found out about the advantage of rolling the ground after seeding, by observing when digging post holes that the moist earth which I used to set the posts with could only be found where the ground had been packed by trampling. Well rolled land will stand a drought better than that which is not rolled.

I am milking sixty-five cows and making fine butter which brings a good price. I am sending to several families in this city and Brooklyn, and am selling all I am making. I make it as cheap in winter as in summer. I stamp the tubs "Ensilage Butter," because I feed nothing else but ensilage and meal. I feed thirty-five pounds ensilage alone, and three quarts corn-meal and ship-stuff mixed, per day, in two feeds, and two quarts ship-stuff at noon. I salt my butter one ounce to pound, though for some customers I salt it three-quarters and half ounce to pound.

With ensilage I can keep two cows to an acre on poor land. I have visited a good many silos but have never seen any ensilage as good as mine. I cut three hundred to five hundred tons of corn ensilage when it is in the sticky stage of the juice, which is older than its milky stage. I want my corn to be as old as it can be without being glazed. The glazed corn does not fully digest. When it is glazed the most of the sugar is in the grain, and you can also tell by tasting the stalk.

I never would plant a field of corn on sandy soil or gravel-sand without rolling after planting to preserve the moisture.

I chaff all my fodder because it keeps better, that is, the ensilage will stand sound longer where being fed from, as it packs closer and the animals will eat it clean; and I have observed that where cows are overfed they will leave the leaves and eat the fine cut stalks by preference. With good corn ensilage cows will weigh more in the spring than in the fall, and without a mouthful of other feed. I have tried this, and it is not guess work.

I can get 25 per cent. more milk from same cows and at one-half the expense from corn ensilage than from meadow hay. There is not any ill taste nor smell in my cream, milk, or butter. Ensilage alone don't color butter, but oats and corn meal make highest color, especially yellow corn meal. I consider fine-cut corn ensilage worth nearly double the green corn stalks, giving that increased value in milk. I have fattened stock entirely with ensilage, and when I have fed ensilage and hay they have not done so well as with ensilage alone.

I can raise corn on my farm, including seed and rolling, for $5.00 per acre, not including cost of manure. The total cost of filling my silos from field, exclusive of rent of engine and engineer, was $100.69, and I have fodder enough to carry 65 milch cows, without any other food, from October 20th to June 1st.

My ensilage costs me, not to exceed $1.00 per ton, when ready to feed, manure and interest on land not included, as the manure comes back from feeding the crop, but including hire of engine, loss by bad weather and break down.

I weight, with barrels of sand, lying down, about 500 lbs. each.

I have had one experience with juice running out into silo, but it had not been weighted nor trampled, and it was expelled by the heat and was re-absorbed. I have used husked corn-stalks, and the cattle ate it, but it is not very rich. I have plowed up my meadows, and raise no hay. I have not had an abortion this year among 40 cows. I feed my horses on straw and grain. I have ensilaged much that was frost-bitten, and it was the sweetest that I ever had, and was probably the ripest. I have not had any occasion to try to improve my ensilage since I began, four years ago.

I came to this Congress to learn, and I have learned one thing that has paid me for coming. What is it? It is what Dr. Harlan said about sowing buckwheat in the fall with the wheat, so that it serves as a mulch for the wheat.

Statement of W. H. Gilbert as to the cost of a ton of ensilage packed in silo, under favorable circumstances.

Cost per acre:		
Plowing	$1.50	
Harrowing, 3 times	1.00	
Drilling	50	
Seed	1.00	
Rolling after planting	25	
Cultivating once with smoothing harrow	25	
Cultivating with cultivators	50	
Cutting in field with reaper	75	
	$5.75	
Allowing 15 tons to the acre, the cost per ton is		38c
Cost of cutting, per day:		
5 men at cutter, including engineer	$5.50	
6 men in the field	6.00	
3 men and teams to haul to cutter	7.50	
1 man in silo	1.00	
	$20.00	
With above force I can cut 75 loads, equal to 70 tons a day, which is per ton		28c
Total cost of a ton	$0.66	

MR. W. W. MERRIAM, of New York.—I have made corn ensilage four years but have never seen juice in bottom of silo. If it has been pressed out it has been re-absorbed, but the ensilage has been as dry at bottom as at top, and I weight 300 lbs. to square foot of surface. I have never seen sweet ensilage but once. It was a dry season, so dry that the corn grew shorter until a rain came, and then it grew 3 feet in a few days, and that ensilage was always sweet. The longer I live the less I know about it, only that I have never had any poor ensilage and would not think of running a farm without it. I am milking 25 Jersey cows, and the cream, is the very best that comes to New York, and brings an extra price. I paid $6,000 for one of my bulls. I get $250 per month for the cream of 25 cows. I fed a Jersey bull on corn ensilage alone, and he increased several hundred pounds; therefore, what is needed to make it a perfect food? I have practiced green manuring in Dutchess County. I turned under weeds and got crops where none would grow before. I have turned under rye 6 feet high, believing it to be the cheapest manure I could use, and each year I got a bigger crop than before. Every time that I plant corn in New Jersey it stops raining, but I have sunk a well 150 feet and have plenty of water always. No man can ever prevail upon me to feed rye, either green or in grain. I prefer to put it under the cows rather than in them.

Common sense teaches us that good food for our milch cows makes better milk, richer in quality and more in quantity—therefore healthier children and happier mothers. When fed to the steer it makes more work, or better and finer flavored beef; so that a man who would look to his best interests, will certainly seek for such material as shall produce, as nearly as possible, these results.

From time immemorial, grass, and grain have been known and used as food for domestic animals, generally with fair to good results. For so many years our farms have been raked and scraped to get off all we could and return the least possible, so that now on an average our fields do not give us a ton of hay to the acre, the country over. In many sections it requires five to six acres of land to sustain one cow a year.

With land at $100 to $200 an acre, one can readily calculate the interest return of a cow that produces $30 to $40 worth of milk or butter per year, and this without counting her cost, or the expense of caring for her, or that she will last no more than four or five years.

Brewers' grains for years have been freighted from town to country, to stuff and steam these milk-producers to larger results, and the soil has been called on for its half-matured annuals to aid in these efforts. And what do we now see? Weeping mothers and little coffins by the score; the sleek undertaker carting away our little darlings to their final rest. It was stated at the present Congress, by one who should know, that "each year in his town the coffins have grown shorter and shorter, the number larger and larger, until scarce any but empty cradles are now to be found." This comes from a section of the country where this method of feeding cows on "brewers' grains" is the usage, so that it is full time a "new departure" in feeding be considered. We have this in the use of properly treated, properly cared-for and properly cured fodder-corn, called "*Ensilage.*"

We know full well that it is easy enough to make poor hay; so will we find it just as easy to make poor ensilage. It is *almost* as easy to make good hay or good ensilage. Good common sense, forethought, and watchfulness will certainly give us the latter.

To obtain the best ensilage requires no more brains or education than to get good hay. The expense of preparing the land, planting the seed, and tilling the soil, is not called for on the hay field, but good hay can only be made when the sun shines, while corn-fodder may be cut and packed away at any time, at half the cost and one-tenth the room.

Suppose one ton of hay *is* equal in feeding power to three of ensilage,

can we not get *fifteen* times as much corn-fodder from the same land? and consequently support *five* cows on ensilage to one on hay?

The farmer who invariably has good hay is he who has good barns to protect it from the elements. So may we say to him who would have good ensilage.

To obtain the best ensilage we need (1st) well-plowed land, the *best southern seed corn* planted in drills 35 to 45 inches apart and 10 to 15 seeds to the foot, with thorough cultivation during the first 30 or 40 days of its growth, and (2d) by short cutting of the stalk and well packing the fodder in good and completely water-proof silos, with plenty of pressure from the top, either by stone on the covers, or earth, sand or gravel in boxes or barrels instead. If of earth or sand they may be used in the stable during winter when removed from the covers.

Only the perfectly good ensilage should be fed. Never feed any that is black, slippery, mouldy or rotten. Either of these conditions may appear in small quantities on the margins, along the cracks of covers, or when air may have reached the fodder during the process of curing. The cost of a few pounds, or hundreds, for that matter, of ensilage is so small that only the heedless or grasping will dare make use of any but the best, nor will they find it to their best interests to do otherwise.

I have been a grower and feeder of ensilage four seasons; have fed lean Western steers, and in 90 days had them fit for the butcher; have fed a herd of high-priced and highly-bred Jerseys for two or three seasons with the most satisfactory results.

There is great pleasure in looking at their sleek coats and feeling their supple hides, knowing that perfect health and happiness shine from every eye. The larger portion of the food has been ensilage the winter through.

Ensilage, born in the Old World, in infancy came to the New, where it was adopted as a child of the agriculturist, and nurtured to manhood; then it recrossed the mighty ocean, entered the homes of the despondent and discouraged farmers of our mother country, where it is now bringing money to their pockets and joy to their hearts. This is only one of the good results of the ENSILAGE CONGRESS.

H. VAN W. MEYER, Madison, N. J.—I have a dairy farm, and milk thirty-five cows. I have been feeding ensilage the past summer, and it helped me over the New Jersey droughts. I believe the quality much depends on time of cutting. The more mature, the better the ensilage. I like to see the juice and the ensilage sticky. I have made excellent ensilage with peas and oats, cut when nearly ripe, and the straw very little

moist. It was not so good when I put it in quite green, or without chaffing, as it don't keep so well and tangles. I have ensilaged frosted corn, and did not see any difference in the ensilage, but I suppose it would have been better if not frosted. My silos are of wood, and above ground, and no juice came out of them. I bought some milk from a neighbor who fed brewers' grains. I kept this milk separate, and some of it went to the brewer who sold the grains. He complained, and said it was the —— ensilage that was spoiling my milk; but I easily proved to him that it was not the fault of ensilage.

EDWARD GRIDLEY, Wassaic, N. Y.—A crop of rye may be grown each year and turned under for a crop of corn the same year; keeps ground busy. I use no other manure for the corn but a little phosphate. My neighbor plows under rye in June, and has raised good crops of potatoes without other manure for past four years.

MR. YETTER, of Conn.—I bought two Jersey cows that do not get in calf. What shall I do with them?

MR. MERRIAM—Give them ensilage.

DR. A. S. HEATH, of N. Y.—I was born on a farm and have taken great interest in the ensilage system, and I would urge on farmers the importance of a variety of food, as the French do. No two grasses are precisely alike, and we see in nature that she provides everywhere a variety. (See Dr. Heath's article on abortion, beyond.)

MR. MERRIAM disputed this proposition and specified the prairies, where only one kind of grass grew for many miles.

O. LINDSLEY, N. J.—I have a stone silo. I have fed corn ensilage that was too green, and all the cattle scoured. The next year it was frosted when in blossom and the leaves were killed. I put it into the silo the next day. It got very sour and stock did not eat it very well, and I threw it out. When I top-dressed grass with it, it killed the grass. This year I put in three kinds of corn; some of it was 18 feet high, one ear weighed 2¼ pounds husked. The supply of milk is better now than when fed best grass pasture, and I feed nothing but ensilage and straw.

C. H. ROBERTS, Oakes, N. Y.—For two years my silos gave out in August, and I was obliged to feed the cattle on growing corn, and I could not give them so much as to prevent them bellowing for more. In 1883 I had my dry cornstalks stacked up in front of my silo, dashed water over them in heaps before cutting, to keep down dust, and threw some water on them as filling progressed.

When silo was filled about six feet deep, I began to force steam in the

mass by the use of rubber hose with a piece of gas pipe at the silo end, about eight feet long, drawn to a point at the lower end, perforated with small holes for the steam to escape in the mass of ensilage.

This was easily plunged in the cut cornstalks as the filling of the silo progressed, and all the steam was used for this purpose that could be spared from the boiler. This, with the comparatively small amount of water thrown on would cause them to pack. Superheated steam contains so little water it did not saturate the stalks, consequently they were not soft and succulent when fed, but they preserved well and stock ate them well. I am feeding rye ensilage, which I find an excellent feed. One silo is partly filled with apple pomace, as an experiment; yet unopened.

Mr. F. S. Peer, of Mount Morris, N. Y., the author of a work on soiling, then addressed the Congress on "Economy of Ensilage and Soiling."

Mr. Chairman—Gentlemen:

On this subject of ensilage I have never been an enthusiast, but after five years' experience with from ninety to three hundred tons a year, I have become decidedly attached to it as a food, especially for milch cows and sheep. I do not pretend to say that it is a perfect food; neither is hay, for that matter. Nor do I care to argue its value as compared with dry forage, from a chemical standpoint, for there is a way in which ensilage proves to be much more economical than dry forage, so that it is not worth while to enter into hair-splitting discussions as to what the chemist finds by comparing dry and succulent food. Undoubtedly the solution of the matter is, that forage in the green or succulent state holds the animal food in a state more easily digested; therefore, more food is assimilated during the process of digestion than when fed as cured forage, in which case the animal food is so locked up in woody fibre that the process of digestion is not long enough or perfect enough to extract from the forage all its feeding properties. It has been my custom to treat nearly all dry forage in this way, namely, cut corn fodder, hay and straw: about equal parts or half hay and half straw and stalks, mixed with a day's rations of roots and bran (sometimes ground oats and bran), wet thoroughly, and left twenty-four to thirty-six hours before feeding. I have tried most everything and most every way, and I have never obtained as good results (cost considered) by other methods of feeding dry forage. I have purposely digressed from the subject, as the experiment covers a question naturally asked, namely: If dry forage can be made succulent and more valuable by soaking, why is it not as well to do so, instead of

handling so much water in harvesting ensilage? It also calls to mind the question of roots. In the first place, ensilage can be grown on most soils cheaper than roots, ton for ton; repeated experiments prove that ensilage, pound for pound, gives better results.

In the case of dry fodder, to obtain the best results it must go through all the operations that ensilage does—cut and cured in the field, housed, run through the cutting machine, mixed with roots and grain, soaked and lightly fermented. When you have done this you have a very fair sample of ensilage.

The ensilage comes from the field direct to the cutting machine, and is placed in a silo, where one ton only occupies 50 cubic feet, when a ton of hay requires 512, and stalks about 900 cubic feet. As to which method is the least expensive, I am inclined to favor ensilage, especially when barn room is considered, but if this is all that can be said of ensilage it would not be sufficient to warrant its general adoption, and the question of building silos would only be considered when more storage room was required.

We now come to a question in comparing the economy of ensilage to other dry forage, that is so undeniably and unmistakably in favor of ensilage that it leaves no room for doubt or discussion, viz.: the saving of land. With ensilage at least four head may be kept against one from the same amount of land with hay. Here, in my opinion, lies the true and unquestionable economy of ensilage over hay, and soiling over pasture; in fact ensilage may properly be called winter soiling. Soiling means more stock, which means more manure, which means better crops, which means less labor, and more money, which is about the same thing. I believe you will prefer that I should speak from actual experience; therefore no apology is needed for alluding to what I have done, as an illustration of the saving of land by soiling and ensilage. Upon an old farm of 100 acres arable land, that had been rented on shares for 50 years, my first wheat crop gave 15 bushels and a peck per acre from one of the best fields prior to my taking possession. There was kept upon the place equal to 12 head, by pasturing and hay. Twelve head left 40 acres to cultivate. By soiling and ensilage, 35 head left 70 acres to cultivate. I had therefore added three head for every one, and nearly doubled the acreage of land devoted to marketable crops. These are facts which, as I have already said, are so unmistakable and undeniable that it establishes the economy of ensilage beyond question.

The above is not for a single year but in round numbers is average for

three years, ending 1882, when I sold this farm and went upon another in Livingston Co.

The past season on land producing not over three-fourths of a ton of hay per acre, we have the following stock : 5 stallions, 14 breeding mares, 12 colts, 30 head of cattle kind and 42 head of sheep, a total of 103 head, fully equal to 60 head of full-grown stock, weighing 1,000 lbs. each. This stock, since about May 15, have been supported from the 48 acres of hay and pasture, 21 acres of ensilage and soiling crops, making a total of 69 acres for 60 head. We have enough forage or very nearly enough to carry them until May 15, 1885. Considering the season and that it is only the second year, I am encouraged but by no means satisfied. We obtained 160 tons of ensilage from 15 acres. This is a light yield. Some claim two tons of ensilage is equal to one ton of hay, but let us say four tons. We can afford to be generous. We then have equal to 40 tons of hay from 15 acres. In other words we are keeping four times as much stock from the 15 acres as if it had been in hay.

Stock should be fed five times a day. The food is in better order in manger when it is not breathed on. I have fed ensilage to horses and they did not die. I nurtured two breeding mares on corn ensilage and straw, and they came out in nice condition. I think it is not so much the animal as the quality of the ensilage. Mr. Peer exhibited two samples of ensilage : one was excellent and very satisfactory; the other, from a neighbor, was apparently sound, but the cattle would not eat it at all. This sample had the smell of mustard, and was probably impregnated with that weed. He was advised to try it by sprinkling meal on it and let it heat at night in a box with cover on.

MARTIN TUTTLE, Hornellsville, N. Y.—I confess that I am *ensilage crazy*. I have fifty cows, and they average 350 quarts per day. I had some frosted corn that was almost white. It would have been a total loss but for my silo, and there was a good deal of it, but it made splendid fodder. We selected two cows and fed them without any grain. They gave excellent milk and gained in flesh, and I never saw cows do so well. They eat 90 to 100 lbs. each per day. In 3 hours the milk showed 25 per cent. cream, which is extraordinary for common cows. The superior quality of the frosted corn ensilage may have been largely due to the loss of leaves by freezing and drying, and a consequent preponderance of stalks and grain in the same bulk. It was nearly ripe when frosted, and that which was frosted made better ensilage than that which was not. I plant 10

quarts to acre, rows 3 feet apart, same as for crop of corn. The silo is matched yellow pine with cement bottom.

J. E. ROGERS, Rome, N. Y.—I put 20 acres frosted corn into silo and it came out good. The best economy in feeding is to feed liberally. To sustain life it requires two per cent. of animal weight, and whatever else we give comes back in some form or should do so.

J. B. BROWN.—The effect of frost depends upon its severity and upon the condition of the crop. The more watery the juice the greater will be the injury, while at a more mature stage a light frost would probably sweeten the ensilage. There is also a relation between the maturity of the juices and the heating in the silo in order to produce the best ensilage, also in the kind of seed planted.

I have three cows, and use an earth pit for ensilage. I take it from the pit and mix it with meal, and drop it into a box with cover. In the morning it is generally hot, but not always. Sometimes it does not heat, but it is always all eaten up, and two of the cows are quite dainty. That which is most heated in silo heats less in the box. I feed 60 lbs. ensilage mixed with 2½ lbs. bran and 1½ lbs. mixed feed to each animal per day, and they look very well indeed. Now this is certainly a very cheap feed. It is made from sweet corn, and reached 150 deg., and is very sour. I am not prejudiced against hay, though the hay field cost me a palm felon, but my cows are. They will not eat any hay, only nibble and waste it, and it is good hay too.

I got a crop of oats and peas from the same land, and put it in wooden silo without chaffing. It did not keep well, appeared to be quite spoiled, but the cattle preferred it to hay and ate it nearly all. From the feed previously stated I am making excellent butter. I get 2 lbs. 10 ozs. of butter now from the cream of 24 quarts of milk. From one grade Guernsey I am now getting 21½ measured qts. per day.

The Congress then discussed the importance of these annual meetings, and the Chairman was requested to appoint a committee of four to take measures for calling the Fifth Ensilage Congress. The following committee was appointed for this purpose: Edward Gridley, H. H. Brown, A. K. Johnston, and W. W. Merriam.

The Congress then adjourned till Wednesday, Jan. 20, 1886, at 12 M.

LETTERS TO FOURTH ENSILAGE CONGRESS.

From HON. EDWARD ATKINSON, the Eminent Statistician, Author and Manufacturer.

BOSTON, January 2, 1885.

J. B. BROWN, Esquire, Secretary :

Dear Sir—It will probably be impossible for me to attend the meeting of the Ensilage Congress, as this is a busy time in my work.

I could add but little to the information which will be given, but I may properly submit some questions which appear to me, as a student of social science, to be of the utmost importance.

In December, 1882, I ventured the following statement in an address: "Our general methods of agriculture are poor and shiftless; our crops are not one-half what a reasonably good system would bring forth. The potentiality of a single acre of land is still almost an unknown quantity. If I were to say to you, that next to the abolition of slavery, and the use of the railway and the steamship, the re-discovery of the method of saving green crops—called *ensilage*—was the most important event in its effect on material welfare of the present century, you might suggest that a commission of lunacy should be appointed to examine the condition of my brain. Consider the waste of fencing, because one man cannot trust his neighbor to keep his cattle where they belong. Witness the waste of sheep, because the cur dog is tolerated, while the farmer suffers."

Commercial crises and periods of great business depression are felt most severely by persons who are engaged in the lower grades of work, i. e., by common laborers and the less skillful mechanics or operators, whose misfortune it is that they depend absolutely upon being employed by others and who have little faculty to change their work, except to some routine method in which their work can be directed by a manager or employer. Even a gift of land would be to most of this class of no value. The reduction in railway construction from 11,500 miles in 1882 to 4,000 miles in 1884, must have thrown at least 450,000 men out of employment, and of these at least 400,000 must have been common laborers, constituting more than 20 *per cent.* of all the laborers listed in the census, aside from those assigned to farms or mines. Is there no remedy for this apparent wrong?

If ensilage can be applied to the production of beef, mutton, wool and eggs at such a cost as to make it possible to renew the cultivation of land in the east which is suitable for producing corn—*then* a very great change must soon occur from *extensive* to *intensive* agriculture. You will observe the IF, and to this *if* I hope the attention of the Congress may be given.

I can only treat the subject theoretically, because my only experience has been in the cultivation of a single acre of corn, the produce of which is cut by a hand machine, and fed from silo to my two cows for home use.

I will, however, venture on a few theoretical considerations. Our common system of producing grain, meat, cotton and wool is *extensive* in the extreme. We are treating our virgin soil as a mine from which we are gradually and surely exhausting the elements of fertility.

Intensive farming is confined mainly to market gardening or truck farming, which cannot be carried on, as a rule, on what I may call the factory or collective method except the master works harder than his men.

What is this factory or collective method?

1st. The factory or workshop is a laboratory in which materials are converted from crude forms into forms ready for consumption.

2d. It requires capital, a head manager, a few second hands or heads of departments and a large number of workmen, each doing his part of the work under intelligent direction, mainly by the piece.

Now may not a small area of land, be conducted on the *intensive* method, as a laboratory, in which crude materials shall be converted into beef, mutton or wool, with eggs as a bye-product?

What is needed?

1st. Brains. A competent head.

2d. Capital.

3d. Second hands.

4th. Common laborers, each doing his specific work, under intelligent direction and mostly by the piece.

Is the beef factory of this kind more complex than the textile factory? Cannot materials be converted into wool in a wool factory or intensive farm by the application of the same method and the same intelligence which we manufacturers apply to the conversion of wool into woolens?

If ensilage answers these conditions, then it justifies my visionary statement of 1882, for which I risked a commission of lunacy.

If such results can be obtained then it will recall our widely-scattered population in some measure from the pioneer life of the Western farmer, in which one generation sacrifices much that makes life worth living in providing a home for its posterity.

If such results can be obtained then we *scatter* the population of common laborers who now choke the alleys and courts of our crowded cities.

If such results can be attained then we provide profitable use for the excess of capital, which now encumbers our money centres.

I may incur the danger of a commission of lunacy for a second time, even by submitting these propositions with an *if*, and I invoke the protection of the intelligent and progressive men who will attend your Congress, if they can justify my questions and proceed to establish a beef factory on an adequate scale.

Very truly, yours, EDWARD ATKINSON.

From FRANCIS MORRIS, of Maryland, the Earliest American Ensiloer, in 1876.

TUESDAY, January 20, 1884.

My experience of ensilage has confirmed all my previously expressed opinions. I am now using a silo filled three years ago, with about 300 tons of corn fodder; its condition is as good as it possibly can be, and it is simply an earth silo made at an expense of less than twenty dollars and covered with the earth thrown out of it. The talk about *building* silos has put the system back twenty years. Suppose we could drop the name of silo and adopt that of corn fodder trenches? I am detained by business in Washington, or I should attend your Congress to-morrow.

From ELDER EVANS, who was present at the Congress.

MOUNT LEBANON, N.Y., January 28, 1885.

Esteemed Friend: You ask about our mode of taking corn-stalks from the field. We use two poles about 20 feet long, extending the wheels. The cornstalks are put across these. It is very handy loading and unloading. We cut up a load in about five minutes. It is carried up 16 feet above the driving floor to the top of silos, which are on each side of driving floor in the south and north corners of the barn, which is built of stone and is 196 feet long, 50 feet wide. A floor, strong enough for all the weights—barrels of sand—is built over the driving floor, extending from the top of one silo to the other. Here they are entirely out of the way. We have doors into the silos on each floor. The silos are 37 feet deep, the bottom on a level with the stable floors where the cattle stand. When we open a silo we take off all the weights and cut a tunnel down to the middle floor, just large enough to throw the ensilage down. There we have a trap door in the next floor, through which we pass it by a tube into a box on wheels, containing enough to feed all the stock on one side of the stables. We use moveable iron boxes to feed in. They swing in and out. Thus we take the ensilage from the whole top every day. It works completely and with the least possible amount of labor.

I have seen no arrangement that is so labor-saving, nor any ensilage better than we are now feeding twice a day to our whole herd of 75 head.

Last season, when the pastures failed with drouth, we fed ensilage, morning and night, when we milked the cows. When the pastures were flush, the cows would still eat half a bushel of ensilage at milking. One of the most important points in the use of ensilage, is the fact that it equalizes the milk so nicely. When there is fullness of pasture, there is a great flow of milk; when the pastures decline, the ensilage comes in to supply the lack, admirably.

In attending the ensilage meeting, I gathered, what the Quakers would call "the sense of the meeting," to be: (1) Have land well drained, well prepared, and manured on the surface—not plowed in; (2) seed about two and a half bushels per acre, drilled in three feet apart; (3) kept clean, and cut when the ears are in the milk; (4) cut one-fourth of an inch long, well packed in corners, and covered with two layers of one-inch hemlock boards, and heavily weighted; (5) fill and weight the same day, if possible. Ensilage thus made and stored, will never fail to give satisfaction.

Respectfully, F. W. EVANS.

P. S.—Filling a silo slowly, to get up heat by fermentation, and then stopping the ferment, is like setting a building on fire, and then extinguishing the fire. Better not kindle the fire. Ensilage has surely come to stay, as soiling staid. Let us build up a science of ensilage. F. W. E.

From DR. A. S. HEATH.

ABORTION IN COWS.

I have been asked to state my views to the Congress, on the subject of abortion: From the latest information on the subject, the cause is attributed to an unknown micro-organism, which attacks the susceptible pregnant cows of the herd, when once developed from these organisms.

It has been produced by actual contact of the matter from an aborted cow, placed in the vulva of an healthy and unexposed cow, in nine days.

From all reliable statistics, it is clear that neither ensilage, brewers' grains, nor even rye, when ergotized and freely and long fed to pregnant cows, ever produced it, so that it may be said, what a cow eats never produces abortion; and should an accidental abortion occur in a herd, where great cleanliness is maintained, no spread, or infection ever occurs.

But as most of the bacteria causing disease are propagated in wet and filthy places, so in stables and yards, and especially when the micro-organisms are maintained and propagated in aborted mothers, does abortion spread in herds.

By separating aborted cows from the herd, and thoroughly cleansing and disinfecting the stall or stable where the aborted cow was, the disease is held in check or destroyed, so that it does not spread.

In all the herds visited in the past year, where abortions had occurred, I felt satisfied that filthy yards or stables always prevailed. Whitewash—sulphate of zinc in solution, or sulphate of iron in weak solution, should be added to the whitewash—should only be used after cleansing with hot water.

Carbolic acid, or sulphur fumigations, should not be used in stables soon to be occupied.

SIGN OF PREGNANCY IN THE COW.

Let a drop of fresh milk drop into a glass of pure water. If the milk promptly disseminates itself through the water, the cow that yielded that milk is not with calf; but if it sinks to the bottom of the glass as it falls upon the water, and does not produce but little of a milky cloud, the cow is pregnant. The specific gravity and viscidity of the albuminous milk being heavier than water, thus retains the drop of milk and causes it to sink.

A. S. HEATH, M. D., D. V. S.

TWO EXPERIENCES WITH ENSILAGE.

POUGHKEEPSIE, N. Y., December 10, 1883.

I did not cut ensilage this year, but wish now that I had. The best way to appreciate ensilage is to go without it one year. I cured the stalks dry; more mould than in all the silos in the country. I must go back to ensilage or reduce my stock.

January, 19, 1885.

I filled my double silo with 10,000 cubic feet, cut ⅞ inch. I cannot, unfortunately, attend the Ensilage Congress. Give my vote in favor of allowing corn to approach maturity, the dry leaves being no detriment; and in favor of slow filling. Less acid in this ensilage, being more mature than that which I ensiloed two years ago full of juice. I also favor planting thinly, to develop an ear to nearly every stalk, as I find that the grain keeps splendidly and has least acid of any part of the plant. Two-thirds or more of my corn was frosted September 14; some had scarcely a green leaf left on it, about worthless for curing dry. But the fodder comes out in the best condition I have yet had, and the frosted portion seems to be as good to all appearances as the bottom, but I believe the uninjured to be rather more nutritious. I cover silo with hemlock boards and swamp muck three feet deep.

WM. H. HART.

RANGELY, ME., March 27, 1884.

I will say that we have ensilaged corn fodder two years. The first year it froze so that we had to stop feeding till warm weather. The second year it is heating very bad, so that we shall not feed only about three-fourths of it. *We are done with ensilage.*

April 14, 1884.

Our silo is made of wood, 50 tons capacity. It was filled both years with southern white corn, cut 1 inch long, and well trampled. Last year we were three days filling, and it was at once covered and weighted with about 100 lbs. rocks per square foot. *It was very green when cut.* Yours, WM. HOAR & SON.

From OTIS BISBEE.

RIVERVIEW ACADEMY, POUGHKEEPSIE, N. Y., Jan. 29, 1884.

I have a better result in the last crop than ever before. I attribute this to the fact that I let the crop go further towards maturity than before. The feed seems to be richer, and there is no expressed juice containing butyric acid. My eight acres keep sixteen head twelve months.

From THOMAS R. SMITH.

LINCOLN, VA., Jan. 30, 1885.

I continue to be well pleased with ensilage. I would as soon think of keeping house without a wife as a dairy without a silo. It is a convenient, healthy, and economical food.

From ABEL B. BERRY.

WALTHAM, MASS., March, 1884.

The only drawback is the drought, which left the silos empty.

From THOS. R. SMITH, Lincoln, Va.

I, with three of my neighbors, are all very much pleased with our two years' experience. We expect to continue as long as we keep a cow.

From GEO. T. POWELL, Ghent, N. Y.

I value ensilage also very highly for feeding pigs and breeding sows; also chickens. My ewes and lambs did very well this winter, and are fed on half ensilage rations. Since silos can be filled more deliberately there is an added value to the system.

From C. H. CHASE, Watertown, N. Y.

You can keep me in the list of ardent supporters of the ensilage system, after three years' experience. My corn was badly frosted, and would not have been worth anything only as ensilage. My cattle wintered well on ensilage twice a day, hay once. I put in some corn without chaffing, but the cattle do not like it nearly as well as that which was cut.

From DR. L. W. CURTIS, Globe Village, Mass.

I have every reason to think more of ensilage than ever. The 6th of August last my buildings were burned, including a wooden silo filled with rye ensilage. When the smoke cleared away I found it was burned in but a little way, and I fed my cows on it for more than two months. My corn was growing in the field, so you see I had something to winter my 40 head of cattle on. I have found a difference of 10 quarts a day this winter in favor of two feeds a day of ensilage instead of one of hay and one of ensilage. Last summer was very dry in these parts, and many farmers did not cut half a crop of hay and sold their stock for what they could get. I have not over 25 acres that I can till or mow. I am able this winter to keep 35 head of cattle (all but five, large cattle), and sell 10 tons of hay, while many farmers with twice the land cannot keep over ten and not sell any hay. What hay I sell will buy my grain, and my farm is growing richer every year. The silo is also a great labor saving, as I put in my clover and rowen.

From EDWARD S. ELY, Lyme, Conn.

I think ensilage the discovery of the age.

From H. O. WALKER, Deerfield Centre, N. H.

I subscribe heartily to the claims that the most enthusiastic advocates of the system of ensilage make for it, and perhaps the best service that I can render is to note some of the mistakes I have made. First: I built too expensively. My silo is of split stone, and for two years 4 or 5 inches next the wall was spoiled by water that made its way through from outside. Last year I sheathed it around inside with one-inch matched boards, and this time it comes out all right, being sound and bright directly against the boards. Second mistake: I got a cutter that was repeatedly getting out of order, rendering the filling a slow and anxious process. With the hay crop one-third short, I am keeping double the stock that I did under the old system. I hope that the approaching Congress will be even better than its predecessors.

From NICHOLAS WALN, Hornerstown, N. J.

My best ensilage was from sweet corn, when one-third of the ears were fit for boiling; my poorest from field corn, when but a few stalks showed silk. My ensilage keeps better next to wood partitions than next to brick. I keep double the number of cattle that I did before I had ensilage, and am still increasing my stock.

From J. H. SHELDON, Dorset, Vt.

I have wintered a good deal more stock, and they look finely, comparing favorably with my neighbors', who have fed under the old system.

From CHAS. E. BALL, Erie, Pa.

BRICK SILO UNDER BARN.

In a week from the time I began to feed ensilage instead of hay and dry fodder, the afternoon's milk went from 60 to 90 quarts, an increase of 30 quarts with a proportionate increase of morning's milk also. I soon detected a favorable change in the cows, eyes

bright, hide loose, hair smooth; and the milk a grassy odor. The last week in May the herd was turned out to pasture, and in a week there was a shortage of 25 quarts of milk per day. The farm contains 80 acres. I found it hard work in the old way to keep 15 cows. At present I have 52 head of stock, and I shall increase to 60. Soiling and ensilage keeps them with more ease to the men than I could keep the 15 head in the old way by pasturing in summer and dry feeding in the winter, besides great increase in milk and fertilizer.

I will give you my opinion of ensilage in a few words. If I were to be deprived of the right to use ensilage and compelled to return to the old way of feeding, I would throw up farming entirely. I owe the fine condition of my stock and the increasing value of the dairy to Mr. Isaac Russell, and to the interest taken by him in the subject of silos and ensilage. See also a later letter from Mr. Ball.

From D. G. FRENCH, Underhill, Vt.

Silo of hemlock boards in and under bay of barn, capacity, 100 tons, cost $44. Cattle eat the corn ensilage (which was just getting glazed), in preference to early-cut hay or even corn-meal, and give unusual quantities of milk. Butter is as fine as best June, and have had urgent customers in private families in your city. Shall put in another silo this year.

From C. B. BACHELDER, Cambridge, Neb.

For five years past we have not been able to keep more than 12 or 15 head of cattle on 160 acres, and we could not feed that many to thrive or give milk as they should. Ensilage is the only thing that will save the farmers from ruin, as this climate is too dry to depend on crops alone.

From ISAAC R. JEWELL, Petaluma, Cal.

Three years' experience, 200-ton masonry silo, corn when ears well developed, barley when in the dough; greatest satisfaction; have built two other silos since.

From D. BOOKSTAVER, Esq., Syracuse, N. Y.

In re ensilage, my experience teaches me no farmer can afford to be without a good silo.

From A. C. AYER, Lowell, Mass.

I prefer several small silos, say 40 tons, to one large one, making less face exposed. Ensilage is getting short, and I am feeding once a day but at a loss of milk. Three weeks in silo cures it completely for feeding. I had rather have 20 tons of corn ensilage than ten tons of best English hay.

From LEROY M. HOLMES, Springfield, Vt.

After three years' experience I find nothing to condemn provided the corn is allowed to stand until it is in the milk. My stock will not eat ensilaged rye if they can get other food. Corn for ensilage should be planted as early as if it was to mature its crop of ears.

From BALLARD & HACKETT, White River Junction, Vt.

Have used ensilage three years for more than 60 head; save one-third expense of keeping them by old way. Cannot afford to be without a silo.

From HARRIS WILLIAMS, Bernardston, Mass.

Can keep at least double stock with ensilage; stock grow fat upon it.

W. F. CHAPIN, Essex, Vt.

Silo made of boards in corner of shed. I think the loss was less than in the cured fodder. We took a cow to which we were feeding good timothy hay and four quarts grain per day, placed her in another stable, substituting ensilage for the hay. She increased from 24½ lbs. to 31½ lbs. milk per day.

JOHN W. GREEN, Holister, Cal.

I have put $1,600 into concrete silos. 300 head of cattle thrive when getting nothing but cut corn ensilage; all like it. I call it a good thing for me.

DR. CLAUDE BAXLEY, Llangollen Farm, Fauquier County, Va.

Cattle fed on ensilage, cotton seed and corn meal were ready for earlier market than those fed in other ways. Farm stock leave clover hay for corn ensilage.

Sheep sick and dying on dry provender have had the mortality arrested when ensilage diet was substituted. Perhaps of all stock they crave green food the most.

I notice that those who have tried ensilage in a small way usually enlarge their operations, and that those who write and talk against ensilage *have no silos*. I believe that it is destined to constitute an important feature in our agriculture.

From ISAAC M. MILBANK, Greenfield Hill, Ct.

I husked my corn standing, leaving husks on stalk. The grain was glazed and some of the stalks green. I put the stalks whole in my silo. My object was to ascertain if the husked stalks are more valuable when ensilaged than when dried. They are much more. If the grain is not thoroughly glazed it answers for pigs and poultry. For weight I used cobblestones in sacks. The stalks are softer than when they went in, but the cattle do not eat them up clean. Hereafter I shall chaff it, as it is easier to take out.

From JAMES G. MOTT, Lansingburgh, N. Y.

Ensilage is the best and cheapest fodder I ever used. Steers and oxen make beef faster with ensilage than when fed on hay and double the meal. I fed a pair of oxen six bushels per day, and one bushel of corn on the ear. They weighed 3,200 lbs. in September, and when sold January 10, 3,700 lbs., and their beef was first quality. They were fourteen years old. I shall build one or two more silos this season.

C. H. COBB, of East Poland, Me.,

has a silo of forty or fifty tons capacity, which cost him $27. It occupies a corner of the barn cellar, extending upwards, and taking up one bend of the barn. The ensilage was perfect, except about six inches next the walls, which was somewhat mouldy. He likes the system so well that he intends to build another silo, four times as large, another season. By careful tests in feeding ensilage to cows, he had made it pay him $12.80 a ton in making milk sold in Portland. He would not sell a ton of ensilage for a less sum than $12.

This past season he had set the milk of his thirty cows and sold the cream to the New Gloucester butter factory. Unknown to him, the manager of the factory recently made a test of his cream, to discover if there was any bad quality about it from feeding ensilage to his cows. He was feeding twenty pounds a day to each cow. The butter factory people acknowledged to him that their test revealed no difference in his cream from that of other dairymen.

Mr. Cobb put into his silo last fall twenty tons of sweet corn, husks and cobs mixed. On this he placed the fodder from an acre of sweet corn. He had fed both out, with the following results: While feeding the sweet corn fodder, the cream gathered credited him with 29⅜ inches of cream daily. Soon after, he commenced feeding the husks, fodder and cobs of sweet corn during an average of nine days, and his credit stood at 33⅓ inches.

From HON. W. T. BENSON, of Cardinal, Ont.

HOUSE OF COMMONS, CANADA, April 4, 1884.

I am satisfied that ensilage will prove a great boon to farmers, as cattle like it, and come out of winter quarters sleek and healthy, after having been fed upon it. I think my Short Horns and Herefords are far more healthy than when I fed a greater quantity of grain and no ensilage. I have kept a pit for nearly a year with the side exposed, and we had only to cut off a few inches of the exposed part, and the rest was about as good as when the pit was opened the previous year. I am preparing 50 to 60 acres for corn to ensilage, and if I have room to spare in my five silos, shall use it for clover.

From MR. J. B. WILLIAMS, President of the Vermont Farm Machine Co.

Another season's use of maize ensilage, as food for milch cows, confirms me in the opinion, that it is the best and most economical of all substances I have used for the purpose.

My stock are as greedy for it as for green cornstalks from the fields in summer, and the quantity and flavor of the milk always improve when we open the silo and begin to feed ensilage. A small quantity of rye, tried last year, was not as well relished by the cattle.

In filling the silo for this season it was packed nearly full, covered with boards, weighted and settled. At our convenience we removed the weights, but not the boards, and cut and filled again, and again covered and weighted. We removed the weights a second time, leaving the boards as before, and heaped up the silo and again covered and weighted it. Thus we have our ensilage in three sections or layers. By this plan we have only about one-third as much surface exposed to the air as when we cut down the whole depth at once.

From N. S. FISH, Sec'y Brown Swiss Cattle Breeders' Association, Breeder of Swiss Cattle, Berkshire Swine, and Collie Dogs.

GROTON, CONN., Jan. 30, 1885.

I am more and better convinced of the value to me of ensilage every year. I can only say in the way of experience for this year that when I filled my silo I did not put any weights or cover on for about one week after we put in all we intended to. We left it intentionally to note the effect, and have never had so little acid develop. In fact, there is no acid smell, and am convinced that to fill slowly is an advantage by putting more in same space, requiring less help and hurry in filling in a limited time.

J. B. BROWN, Sec'y, E. C. ERIE, PA., Feb. 2d, 1885.

Dear Sir—Having grown tired of the constant worrying, long days and overwork attending a milk dairy, I sold out all my milch cows last fall, and as fast as we could find them we filled the stable with steers, intending to fatten cattle for the market for the future, on corn ensilage and meal. We have 54 head of cattle in the stables now. Most of them will be two years old in the coming spring. We did not weigh them before we commenced feeding, so cannot give any idea of the increase of the weight and growth made. We commenced by giving them what ensilage they would eat up clean, with a large handful of meal three times a day, and gradually increased the amount as they could stand it, up to the present time, Feb. 2d. They are now receiving 45 lbs. of ensilage and 6 quarts of meal per head each day, and although they have not increased very much in flesh, their growth has been wonderful, and the neighboring farmers remark that they never saw young cattle grow so fast.

They have not received any other food besides the ensilage and corn meal as stated. This proves satisfactorily to us that young cattle can be taken from the pastures in the fall, placed in warm stables, and fed with ensilage and a little meal during the winter months, and made not only to continue but to increase in growth. Our neighbor's steers of the same age and wintered the old way do not show a particle of increase—they will not be much better in the spring than when they were put in last fall; so much for the steers.

I can now give you the result of an experiment made on a pair of oxen, and although it may not be of use to farmers generally, ensiloers will see the point gained at once: One day last spring Mr. Russell come home with the largest, poorest and oldest pair of oxen that it was ever my lot to see. They were gigantic in frame, but so poor and weak that they staggered as they walked. On examination I found their age to be beyond calculation, and on looking into their mouths I found them possessed of but few grinders—an obvious reason for their being so thin. The poor things could not chew the feed that was given to them, and not being able to do any work they were treated accordingly. I asked Mr. Russell what he expected to do with them. He answered that he had been looking for a poor subject to test the charms of ensilage on, and thought that they filled the bill perfectly. The oxen were subjects of ridicule, and many a joke was cracked at Mr. Russell's expense, especially by the farmers that have never been educated up to a belief in an ensilage diet. The oxen were placed on the scales, and in spite of their extreme leanness, they weighed 2,870 lbs. They were fed half a bushel of ensilage and a pint of meal three times a day, and improved so fast that by the time spring plowing commenced they could do a fair day's work. During the summer they received 50 lbs. of ensilage a day, with a handful of meal when they were working, three times a day—also a

little green cut clover. They were put into fat the first week in November; commenced by giving them one quart of meal a day with sixty-five pounds of ensilage, increasing the meal as they were able to stand it, up to twelve quarts a day. They are now receiving sixty-five pounds of ensilage and twelve quarts of meal per day, February 2d, just ninety days from the time we commenced giving them their rations. Before they were put into the stalls they weighed 3,000 lbs. We just weighed them again, February 2d, and they weighed 3,560 lbs., an increase of 560 lbs. in ninety days. We expect to make them go considerably over 4,000 lbs. It must be borne in mind that this test has been made on old, worn-out, toothless cattle, and it goes to prove the enduring qualities of ensilage.

Very sincerely yours, CHARLES E. BALL.

THREE EXPERIENCES WITH ENSILAGE.

NATIONAL SAILORS' HOME, QUINCY, MASS.,
January 29, 1885.

I am still of the opinion that the fodder is better if put in the pit uncut, and it is a valuable method of preserving a *portion* of our fodder. This season I intend to silo a lot of fodder after it has been wilted a couple of days, partly because it will handle better, and partly to see if a better product will not result.

W. L. FAXON, M. D., Supt.

BERNARDSTON, MASS., February 1st, 1885.

Dear Sir—I do not know as I should make any change, unless it is to add a few more acres of ensilage corn. One man in this town put his corn in silo without cutting. What the cattle do not eat he runs through a small cutter. It packs solid, and has to be cut out with an axe. It is a little mouldy. For me, I like it much better cut fine, though the expense of good machinery is considerable. HARRIS WILLIAMS.

From MR. W. R. STRONG, Golden's Bridge, N. Y.

I still ensilage my corn whole. I pack in silo alternately, butts and tops. The cattle eat the leaves first and then the tops, and begin at small end of stalk and eat toward the large end; what is left goes to the pigs.

HOW TO BUILD A CONCRETE SILO.

KINDLY FURNISHED FOR THE ENSILAGE CONGRESS, BY MR. W. W. MERRIAM, OF NEW YORK.

Concrete silos when properly made are the very best in use—absolutely frost and water-proof. Rosendale cement may be used with the most satisfactory results. I have used it for four years, and when the cement is rightly handled nothing can be better. It is important that the cement be freshly made and mixed only in small quantities, and then used at once, after the water is applied. The mixing of concrete should be done as follows: To one part of dry cement put three, four or five parts of coarse sand and gravel; these should have no mud or earth mixed with them. The sharper the sand the better the mixture; the gravel may vary in size to a pound weight. The finer the sand and gravel, the longer in drying. Thoroughly mix the cement, gravel and sand in a

dry state, by shoveling them over and over until the former is scarcely to be seen; then apply the water, in small quantities, as the mixture is wanted. An hour or two will often cause the cement to set, as it is termed, after which it is of little value.

To make a concrete wall: If below the ground, the earth or bank may be used for one side support; on the other or inside, set posts 6 to 8 feet apart clear around the cellar, 1½ inches further in than the inner side of the wall is intended to be; let these posts run a foot higher than the wall is to be made, and carefully braced from the inside. 1½-inch planks set on edge are placed on the wall side, resting against the posts, forming a box, with the earth. The concrete is then mixed, and this space filled in clear around the cellar; then other planks are placed above those first set, and the concrete filled in as before. If sufficient time has elapsed from the start, to allow the first batch to harden, the planks may be raised up the thickness of the first plank and filled in as before, and so on to the top.

Great care should be taken that the concrete shall have hardened as you leave it exposed, or your wall may be in the cellar bottom before you know it. This is a kind of work that can't be driven. Much depends upon the kind of weather, as to progress made. Wet weather will not answer; dry is the only kind.

If the wall is to be built above ground, then posts and planks must be placed both sides and thoroughly braced from the several outsides. If the wall is to be 15 to 20 feet high, it will be safest to leave a row of planks every four or five feet, which need to be moved up or down their thickness every three or four days; this is to permit the wall to dry where planks cover.

First and last, and all the time.—The mind of the builder needs to be on his business, that the mixture does not stand too long and set before use, and that the planks are not lifted before the mortar stiffens, and finally, that the wall get well hardened before the posts and plank supports are removed. Twenty to thirty days are safer than less. If rain falls during the work the wall should be thoroughly covered. When the supports are removed and the silo completed, then the mason will need to make mortar of cement and good sharp sand, and plaster the inside that the walls may be smooth and plumb.

The sad condition of Monsieur Goffart's health is explained in the following letter from his sister-in-law, he having been attacked by congestion of the brain:

MON CHER MONSIEUR: PARIS, le 18 Janvier, 1885.

Nous nous associerons de vœux, mon mari et moi, et assisterons par la pensée à la réunion en faveur de l'ensilage qui doit avoir lieu le 21 Janvier, à New York. Je vous ai laissé ignorer le triste état de santé de mon excellent beau-frère, pour ne pas jeter du noir sur cette agréable réunion. Des congestions successives ont alteré ses brillantes facultés, et les médecins ont constaté un commencement de ramollissement du cerveau, cela nous plonge dans une affreuse douleur, mon mari et moi.

Je regrette de vous apprendre, Monsieur, cette pénible nouvelle. Si par bonheur, une amélioration se produisait je m'empresserai de vous en faire part, connaissant le vif intérêt que vous portez à mon malheureux beau-frère.

Veuillez agréer, cher Monsieur, l'expression de ma considération la plus distinguée.

EUGÉNIE GOFFART.

HOW TO RAISE EIGHTY TONS CORN STALKS TO THE ACRE ON GOOD SOIL.

A square acre is 208 6-10 feet across, each way. If you plant the corn in rows four feet apart, then we shall have 52 rows of corn to each acre, each row being 208 6-10 feet long. In each of these rows it is advisable to drop 10 to 12 kernels of corn to each running foot. The corn should be covered with the soil sufficiently to conceal it from view, but not deeper. Immediately after sowing, it is advisable to go over the corn patch every week, in fact as frequently as practicable, with the smoothing harrow, which has inclined teeth, so that the teeth will not pull out the corn to any extent. It will stir the surface of the soil, keeping it from baking, and making it susceptible to the influences of the air, etc. Continue to go over the corn patch with the smoothing harrow until the corn is up four to six inches high; then cultivate between the rows with the ordinary cultivator, until the corn gets up high enough to shade the ground, so that the weeds will not grow. By thus going over the patch of corn with the smoothing harrow, some of the tender plants will be torn out, perhaps, with the harrow; but as the seed has been sown ten or twelve kernels to each running foot, if one-half of the plants should be torn out, there still would be enough left. In our experience, we find that if four or five stalks to each running foot are left to grow, it will be sufficient. And, as before stated, 52 rows of corn to each acre, with three stalks of corn only to each running foot, gives us 625 stalks to each row, or 32,500 stalks to the acre.

On an acre of ground in the Mohawk Valley, carefully prepared by us, first ploughing pretty deep, and thoroughly pulverizing the soil, then putting on the manure and harrowing it under the surface slightly, and sowing and cultivating the corn as stated, we have obtained a yield which seems almost incredible. We had stalks weighing up to 7½ lbs. each, which were from 13 to 16 feet high. We failed to find any stalks that weighed less than 3½ to 4 lbs. each. Calling the average weight of each stalk 5 lbs., 32,500 stalks to the acre, would give upwards of 80 tons to each acre. Of course, this means that the ground shall be well ploughed and pulverized, with a good dressing of suitable corn manure put on the land, and harrowed in just before sowing the corn; and that, after sowing, the patch shall be thoroughly harrowed, and then cultivated as before described. The rows of corn being from 3½ to 4 feet apart, 1½ bushels to the acre is enough seed to sow, if in rows as advised; but where farmers have not drills, then would sow 2½ bushels to the acre, broadcast. Thoroughly harrow the corn under the surface, and as soon as the corn shows above the ground, immediately harrow with the smoothing harrow as described. The harrow will tear out enough plants so as to leave about the right number of stalks to grow. The idea is, that it is important to keep the surface of the soil scarified or disturbed, so as to permit the action of the air upon the soil; for without harrowing, the surface becomes baked and permits a crust to form over the ground, which prevents the rapid development of the corn.

We have stated in these directions, extreme results, which may be reached. We think, with the ordinary facilities, an average of 25 tons per acre can be realized. We find that while this falls far short from what our experience has shown us we can produce every year, yet it is quite wonderful; for one ton of corn fodder per month is sufficient for one cow, therefore one acre of this corn fodder will furnish enough food for at least 20 cows for one month. And figuring from this, we find that 10 acres will supply

enough food for 33 cows for six months, feeding exactly the same grain to stock that would be fed with hay and straw. This is a strong argument in favor of building silos, in order to keep this fodder corn fresh and sweet for winter use.

Butter made from sweet, good ensilage is excellent in quality, and the yield is very great.

BURRELL & WHITMAN.

AN EXPLANATION.

In "How the Farm Pays" Mr. Crozier states in regard to ensilage system, after frankly acknowledging that he has had no experience with silos: "I know of several cases where it has been abandoned, and the system of feeding, such as we practice, has been again resorted to. A large and successful stock-raiser in the vicinity of Toronto, Canada, who had expended $3,000 on silos, after three years' trial has abandoned the system and fallen back to the old method of feeding with dry fodder and roots during the winter months. Still, in this case, there may have been some bad application of the system which made its working unsatisfactory."

Having ascertained that there was but one silo near Toronto, I applied for the following explanation from the owner, Rev. Wm. Ormiston:

NEW YORK, February 10th, 1885.

Dear Sir—Under my direction a silo was constructed and filled in 1882. The preservation of the green fodder was excellent, and it was relished by the stock. But it was fed out so irregularly and so utterly mismanaged by those who had the charge as to furnish me no just criterion of its comparative value, as feed either for beef or butter. The farm is now rented and the tenant has not used the silos.

W. ORMISTON.

THE MINOR PROBLEMS OF ENSILAGE WILL REQUIRE A LONG TIME TO ENTIRELY SETTLE THEM.

1st. The kind of seed. It is reasonable that the Southern seed corn, raised as it is one stalk to a hill, and in abundant heat and air, must make the best cornstalks.

2d. Whether the heating in the silo by slow filling and thereby securing sweeter ensilage produces as nutritive a food as that corn ensilage which is filled rapidly and is sourer, but which heats more (if it does) when exposed or re-confined in a covered box to heat before feeding? in both cases being of the same maturity.

3d. Whether ensilage ever affects the milk and butter, when fed without cotton seed or oil meal, or other mixture; or whether such complaints do not come from weeds and cotton seed, or refuse of glucose factories. All of these have been known to injure the product, when fed with ensilage, and I have never yet found sound ensilage and good meal to injure either milk or butter.

APPENDIX.

PHYSIOLOGICAL VALUE OF ENSILAGE.

An Address by T. S. LAMBERT, M.D., A.M., LL.D., of New York, at the First Dinner of the Ensilage Congress.

GENTLEMEN :—I came to this entertainment to listen, not to speak ; to gather knowledge, not to distribute it. Until within five minutes it was understood that, having nothing to say, I should not be called upon. But within that time a train of thoughts has flashed through my mind, so interesting and so very important, as it seems to me, to those here gathered, that duty will not permit me to refuse to present them.

I should, however, hesitate if I did not see in the expression of each one before me the indications of rare intelligence and a willingness to seek knowledge under difficulties, and to consider that "half a loaf is better than no bread," since I cannot make every point that you may wish to enquire about perfectly clear.

Why should a city doctor take so deep an interest as I do in your vocation of ensiloers? I may illustrate that there is a reason higher than any pecuniary one, for wishing well to your enterprise, by referring to what has been done by your Chairman of the evening towards promoting ensilaging in the United States. Indeed, I have so long been intimately acquainted with him, his thoughts, motives and feelings that I am certain that the grand impulses that have actuated him to work for this cause have not arisen from any mere pecuniary reasons. [Applause.]

You are seemingly impelled to attend these Congresses (that is, judging from your remarks), to discuss the value of ensilage for animal food, and to learn the best modes of producing, preserving and feeding it, that by the sale of beeves, of milk, of cheese and butter, especially by the last, you may fill your pockets.

This is not only right, but laudable. Butter has, however, a higher relation to human welfare than is to be found in its flavor, or in its relation to the money it brings in. However high the price at which you sell it, that which you *eat* is vastly more valuable to you as we shall presently see, though I can present it in only a feeble manner compared with its paramount importance. But if I succeed, as I think I shall, in causing you to appreciate one-half of the value of butter, and its like, to man, you will no longer wonder that two doctors are deeply interested in your proceedings, but you will wonder why your rooms are not thronged by every doctor in the city, and by every other philanthropist.

The great Goethe, next to our own Shakespeare, the most sententious and quotable of authors, says,

"MAN is properly the only object of interest to MAN."

This is a most profound and practical truth. How is it related to ensilage, do you ask? The more and the better the ensilage, the more and the better and cheaper will be the butter made, and the more of it will be eaten ; and the better will be the brains

of men, since, as has been recently shown, and as I shall prove, there is no one substance that is better for brain food than butter.

Hence, if you see that the multiplied production of ensilage multiplies the production of butter, and if you understand that that multiplies the activities of the brains of men, doubling, perhaps, the usefulness of their lives, tending also to civilize and to ennoble them, will you not gladly appreciate the fact that, however you work most assiduously for yourselves in the production of butter, you efficiently labor for the advancement of all mankind, and that when you drive out of the market "oleomargarine," skim-milk, half-cream, and larded cheese, you are serving the great cause of humanity twice, while you serve your own personal interests once. [Applause.]

I will now bring before you in detail the relations of butter to the human brains, and to the other nervous centres in man. These are composed, distinctly to the eye, of two kinds of nervous tissues or substances. One has a gray color and a jelly-like consistence to the eye and to the finger; but under the microscope it is seen to be chiefly composed or conformed of cells or bags of very irregular form. These are very minute, but their great numbers abundantly make up for their small size. These are the active parts of the brains, the battery parts of the nervous system. Not a sensation, emotion, intellection nor volition occurs, except through the instrumentality of one or more of these cells, which break up or decompose, in order to produce such results. By this means a certain amount of the grey matter is rendered unfit for use, and passes in its waste form into the venous blood, coming away with it from the head to go where it can be thrown out of the body. The place once occupied by these decomposed cells must be supplied by other equally good ones, or the processes dependent upon the activity of the brain will cease. This is not mere theory, not doubtful, but is undeniable fact, and in many ways can be proved.

The other substance of the nervous centres is white, and conformed of fibres named, when in bundles, nerves. They extend between centres, and between them and all parts of the body. They correspond to the telegraph wires in the street. Changes in them take place much more slowly than in the gray parts.

It is here important to state distinctly, that there are two great different kinds of nervous systems in every person, and in all of the highest animals. Then comes a lower class, in which there is but one of these kinds, while in the lowest animal there is neither kind. This class has not any tubular circulation—that is to say, no blood circulating in tubes. Hence a nervous system is not needed. But, when we find an animal in which there is a tubular circulation, a nervous system is needed to control the circulation of blood in the tubes, in accordance with the needs of the case. There must be central ganglia to produce a controlling effluence, and nerves to transmit to the tubes that effluence.

The action, activity, or the production of the effluence, of the ganglia, is named gangliation; the action, activity or transmission of the effluence by the nerves, is named nervation; where inward, or toward the ganglia, it is named innervation; when outward, or from the ganglia, it is named enervation.

All these ganglia, and their nerves concerned in any animal in controlling the circulation of its blood collectively, are named the circulatory nervous system (also ganglionic, sympathetic, organic, etc., nervous systems).

As man has a very extensive and complex tubular circulation (so have all the highest

animals), he must have a correspondingly extensive and complex circulatory nervous system. This system, controling the flow of blood, of course controls the temperature and nutrition of the whole body, each being a very important, a *sine qua non* office. Each office is performed without any consciousness of the man or animal, at least when the office is well or healthily accomplished, yet these automatic activities take place perfectly.

The ganglia of this system and their connecting nerves form two chains, extending from the facium down through the neck, chest and to the lowest part of the abdomen. These ganglia are for the most part about the size of grains of wheat, and these chains of them are found upon each side of the bodies of the backbone or spinal column. Other ganglia of the like or smaller size are found in, on, or near each of the organs of the cavity of the trunk. These ganglia are related by nerves to the aforesaid chains of ganglia.

Each ganglion communicates by means of nerves with the blood-tubes of its domain, and if healthy, regulates the temperature and nutrition of that domain in accordance with the needs of the domain. If one of these ganglia is healthy and vigorous and another is sickly and weak, so will be the temperature and nutrition of their respective domains.

In man and in the highest animals there is also a mentory or cerebro-spinal nervous system. The ganglia of this system are very large, but not any more nor so much *vital* as are the smaller ganglia of the other system. The ganglia of this system are in the head, throughout the spinal cord, and small ones are upon the root of the sensatory nerves; and even the greater part of the gangliation of this nervous system is not attended with consciousness, so that in case of this system we have both conscious and unconscious gangliation, and in the other system wholly unconscious gangliation.

The now very evident important question—*the* question of questions—is: What are the gray, exceedingly delicate, active, changing, unstable parts of the ganglia, not merely conformed from, but of what and how are they constituted, what food should we eat in order that they may be well constituted and able to perform efficiently all that is naturally devolved upon them, the most important services in the body; that is, how can we supply the ganglia with the needed new matter as fast as they require it for their greatest and best activity?

This question, until very lately, could not be distinctly, conclusively, and satisfactorily answered. But I now come to preach to you a new gospel of food (in part), and that cannot be gainsaid.

A practical analysis of the brain fully showing to us its food relations has not until very lately been presented to the public. True, nearly fifty years ago a French chemist, Lavoisier, observed that the amount of phosphorus in the brains of active life was greater than in those of infancy, old age, and dementia; and the truth was thereupon proclaimed, and I believe first by myself, that food containing phosphorus must be used for brain renewal. Dr. Draper, in the early editions of his Chemistry, announced that phosphorus was the light of the brain; and a German said, "No phosphorus, no thought," all of which first caused a laugh of the ignorant learned, but after a few years was intelligently or blindly accepted. I well remember that years ago a general guffaw burst out from the members of an Educational Convention in Albany, where I illustrated, by name, various kinds of brain food, and that what I said was inserted in the New York *Times* with a

dash of ridicule. Yet, although the light was dawning and creeping very slowly toward the meridian and sure of its mark, the great practical point was overlooked. Indeed, Sir Henry Thompson, in his little book upon foods (republished a few years since by the Harpers for twenty cents, and which, if read, will benefit every one), demonstrated that fat in some form is consumed by every son of Adam, no matter where he lives, in the tropical, temperate, or frigid zone, and that butter or its like is the delight of all people. Yet he did not show its relations to any part of the body. It has also been noticed in the books that the brain is a "fatty substance," yet this fat has been supposed to be an accident rather than an essential. The brain has also been noticed, in most prolonged diseases, to retain its plumpness; and that in such cases life continues as long as fat lasts, and that it is exhausted last from the cushions upon which the eyes rest, and that when those sink, death is near. Yet the hint that fat was *the* essential to the life of the ganglia was not taken.

Again, about ten or twelve years ago a German discovered that a substance, an organic principle that he named LECITHIN, was the chief constituent of the gray part of the brains and other ganglia. It is a slightly yellowish, waxy substance, and so named because he first found it in the yolks of eggs. It abounds in the semen, is found in the human blood-cells, and in the electrical organs of the ray-fish, etc.

He also gave the atomic constitution of LECITHIN—C 44, H 90, NPO9—(carbon, hydrogen, nitrogen, phosphorus and oxygen, each so many atoms as mentioned). Others found variations in the figures of the first two, while all agree as to the last three. The reason is that the first two differ in different cases, and in the same man or animal in different ganglia, or in different parts of the same ganglion. The above statement may be considered as typical.

But this statement does not give us any practical hint in regard to kinds of food to be eaten. Years more passed before the organic or proximate elements of LECITHIN were announced. It was found to be a di-oleo-palmitate of the glycero-glacial-phosphate of choline—namely, di-oleine, di-palmitin, glacial phosphorus and choline were the food components of LECITHIN, of which oleine and especially palmitin were the chief; and these, together, are only another name for butter.

There are three kinds of fat usually eaten: stearine, the hardest, corresponds to beef and mutton suet; oleine, corresponds to oil (pure), such as that which first exudes when fats are heated; palmitin, corresponds to the chief part of butter, also found in most natural animal and vegetable oils. Margarine was supposed to be a fourth kind of fat, but is found to be a mixture of stearine and palmitin, chiefly the former, so that oleo-margarine which name was intended to indicate that it contained no stearine, now betrays by its very name that it is a sham and a shame. [Applause.]

Each of the three fats is composed respectively of stearic, oleic and palmitic acids combined with glycerine. These acids are not sour. The stearine candles of our shops are in fact stearic acid, the glycerine being removed from the stearine. Each of these fats, as we usually see them, are what are named technically, tri-acids combined with glycerine, namely, three molecules of acid to one of glycerine. There are also di- and mono-stearine, oleine and palmitin, composed of two, and one molecule of acid to one of glycerine.

The fat in the brain is a di-oleic and di-palmitic acid, not directly united with glycerine, but through the intervention of glacial phosphoric acid. The tri-oleine and tri-palmitin of

butter as we eat it, have somewhere in the body their glycerine separated from them and the tri-acids are reduced to di-acids, of which seven-tenths of the gray parts of the ganglia are composed—more than half the bulk of the gray substance of the ganglia being composed of butter or its like. This shows why oats are so good for horses, and oat-meal, properly cooked, so superior for human food. Oat-meal contains ten per cent. of fat, which is also chiefly di-oleic and di-palmitic, hence even better than butter for brain purposes. Thus it can aid in rapidly renewing the gray or active portions of the ganglia of horses, and making them lively and spirited. It must and does have the same effect upon man.

The choline of the LECITHIN is a simple substance, $C_5 H_{15} NO_2$, that we do not and need not eat as food, it being always composed in the body. It is found in the bile, was first found there (hence its name from Greek, *cholee*, bile). Some suppose that it is produced from the waste of the body. However produced, there need be no fear that there will not be enough of it. Little of it is needed and almost any meal of food will supply that. The glacial-phosphorus is very small in quantity in LECITHIN, and the meals of almost any day will supply the requisite quantity of it. A deficiency of the appropriate fats is what is most to be feared. Therefore let the farmers eat plenty of oat-meal, sugar and cream; butter both sides of their bread, eat cream plentifully and be sure that cheese is rich, double-cream cheese. The fat of fish is of animal fats next to butter for brainal service, sweet or olive oil next in order, pork fat next, and better than suets. The fat of the horse is nearly like butter; so that when in the siege of Paris, horse fat was used as a substitute, it was liked so well that it is still used abundantly, and a friend who is distinguished for his acute sense of taste, and who tested it at my request, assured me that it was not distinguishable from good butter. The fat in the human system is nearly like butter; so is the marrow and the intestinal fat of most, if not all, animals. The tripe-fat of animals is very much like butter.

To have the facts well appreciated, I should say that the molecules of stearine are the largest, those of oleine smaller, and those of palmitin the smallest. Now, fat is not changed, only dissolved, in the digestory organs, each molecule being detached from the others, and entering the blood singly. This passes from the bowels through the minute villi which, like the piles of velvet, form the inner surface of the bowels. These villi are immensely numerous, but very, very much too small to be seen by the naked eye. The molecules of fat pass into them, not through any direct opening, but through their substance, as water will through paper. It may easily be allowed, therefore, that the smallest molecules of fat would easiest pass into the villi, and thus find their way into the blood. It may also be easily conceived that the most refined people, —those whose skins and other textures are fine—would also have finer villi than "coarse-grained people," who may, perhaps, with profit eat stearine. That will answer as well as palmitin to keep them warm, when it is deposited next the skin. Nor is it impossible that in such persons, and in some animals, a coarse and sluggish kind of brain can be composed in part of stearine. Indeed, Diakonow found the LECITHIN of certain animals to be what he names a di-stearyl of glycero-phosphate of choline, the di-stearic acid taking the place of the di-oleic and palmitic acids in man.

Permit me now to call attention to the rapid change of brain that occurs in the head of any active man. Certainly not less than once in a month, or twelve times a year, the entire amount of gray substance in the brain is removed, and new substance is built up

instead. This time is, of course, a judgment, nor can we demonstrate the time, but I believe the time mentioned is far within bounds—a week would be more practically true, as I believe. All parts of the body change with great rapidity. A man eats about 800 lbs. of food per year, drinks about twice that weight of water, and absorbs 600 lbs. of oxygen; more substance than a ton of ensilage would represent, besides the oxygen taken, would be needed to sustain him, and produce all the changes that take place in him annually. The chief part of this, to be sure, is needed to keep him warm, but enough nutrition is needed and used to exchange his whole body, with the exception of small parts, once, at least, every six months. We set up a monument of stone over the body when it all goes away, or dies at once, and call it "sacred remains." But when we daily cast away part of what was our loveliness, or source of our activity, we treat it with utter contempt and wash it away into the ocean, that we may as soon as possible forget that it ever existed.

Let, then, the farmer pride himself, as he is building and stocking his silo, and experimenting with his ensilage, that he is a mighty force in the intellectual world, and congratulate himself that if he has not all the learning in the world, he is, if a silent, yet a necessary factor in accomplishing all the great deeds of the world.

Now, in conclusion, let me draw your attention to a few facts in regard to LECITHIN, of immense importance, co-equal, indeed, with the welfare and happiness of mankind.

Of this LECITHIN, Michael Foster says: "It is easily decomposed;" it is readily soluble in alcohol. Of choline, one of the proximate elements of LECITHIN, he says: "It is most unstable;" and at the touch of alcohol it wilts at once, and is transformed.

Is it possible that if any reasonable man knew the effects of such poisons as alcohol upon the delicate nervous tissue of his brain, he would allow the least particle of it to reach that citadel of his happiness and welfare? Let him remember that the gray matter of his ganglia, if healthy, is his best friend, but if abused, becomes his worst enemy. Alcohol is equally injurious to the other ganglia. I speak of this with the more pleasure and freedom because I perceive by what remains upon your dinner table, that no one was so unwise as to poison himself with alcoholics. [Applause.]

I can testify that no addition to the "liveliness," "wit," and "good time" enjoyed after the dinner, could have been made by that winecup, which so many in their ignorance think essential to the full enjoyment of a festal evening. I thank you, gentlemen, for this additional testimony of the non-need of "putting in our mouths that which will steal away our brains." [Applause.]

In reply to questions of Mr. Smith, of St. Albans, Vt., I would say, that the production of alcohol in minute quantities in silos is not impossible. The most that has ever been found, or asserted to have been found, of alcohol (0.21, namely, a little less than one-fifth of one per cent.), and of acetic acid, is too small to excite anxiety about their effects, even if these small amounts were eaten; while, fortunately, the spreading and airing of the ensilage, after being taken from the silo, and before being eaten, would allow the alcohol, ever ready to evaporate, to float above the possibility of harming human or other life.

Some think that the heat of the silo indicates alcoholic fermentation as its cause. I do not. It can be possibly, is probably, and, as I think, certainly, produced otherwise. It is a law of Nature that when liquids change into solids, heat is disengaged. In the silo, when the packed forage is in a certain condition of unripeness, the change from a

liquid to a solid condition of some of the juices rapidly takes place, producing a high temperature ; if the forage is riper or dryer, the heat is not as great, or if the ripeness or dryness is at a certain point, there is no increase of temperature. Such are the facts, as stated by all ensiloers, and they perfectly support my idea.

The conditions of the ensilage are not such as could permit, by alcoholic fermentation, so high a temperature as is often reached; nor could its heat begin to appear so soon as it does, nor could it increase so rapidly, nor would it subside so soon or so rapidly as it does if fermentation was its source.

True, the yeast cells may be taken upon the fodder into the silo, the sugar or the starch is in the fodder, but all that does not show that they, the cells and the sugar, can come together ; they cannot, with few exceptions, not worth counting. The rapid development of the yeast cells requires a liquid medium in which the sugar and some nitrogenous substance are dissolved, except when, as in dough the cells are by much kneading thoroughly distributed. Again, they need a certain temperature, seventy to eighty degrees, which does not often exist in the silo when the ensilage begins to heat. If heat begins to be evident before the temperature essential to the working of the yeast cells appears, why cannot its increase continue without the aid of those cells? Again, the heat of the ensilage often rises to a temperature that would kill the yeast cells, and still increases above that degree. The points seem to be conclusive.

In the table of comparative analyses of grasses and ensilage, you will remember that the fibre of the grass was diminished, and the carbo-hydrates almost correspondingly increased in the ensilage. This fibre is chiefly cellose, which has the same constituent elements as starch, viz.: carbon, hydrogen, and oxygen. If one molecule of water is added to five of starch, we have the typical sugar named glucose, the precise substance that, without digestion or modification, will enter the blood, and is needed there to produce heat in all animals. This change goes on in the silo, producing heat and digesting the cellose into glucose, or some nearly-allied substance, from which glucose is readily produced.

The reason why June butter is the sweetest, most odorous and abundant, is because the cellose is then in its tenderest condition, has the least silica or lignin, while many flowers are also eaten. The tender cellose of the grass is very readily changed into glucose; nor does the cow suffer in her teeth nor health, because her food is not hard, but her turgid udder and the brimming pail at night and morning testify that all is well within her. Ensilaging may, therefore, be considered as a Juneing of the fodder. [Applause.]

But some object to ensilage, because it has not the smell of grasses, saying that it has a vinous smell; and some even say that it has a smell of decay, or a sour smell indicating a decaying condition.

Now a test of the food digesting in the stomachs of cattle will convince any one that ensilage in the silo is passing through something like the same process. Or if a person will take the trouble to take from the cow's mouth a part of the cud that she is diligently and happily chewing, and will bring it to his nose, he will perceive the ensilage smell decidedly, and no other.

If we chewed the cud as the cow does, we should doubtless delight in the smell, thereof. She likes the smell of ensilage, and likes it when considerably sour—in which condition it is probably the best for her. There is a trifle of acetic acid in the

juices of ordinary grasses (not in those of corn), and therefore the presence of the trifle of it in the ensilage cannot make it an unnatural food. Nor is the appetite of the cow therefor unnatural.

It appears then that ensilage is desirable:

1st. Because an enormous crop of corn, and of some other grasses, can be raised upon moderately good soil; and almost certainly, and with irrigation quite certainly, every year.

2d. Because stalks ensilaged are kept more tender and juicy than they can be in any other way.

3d. Because the silo will thus develope the (if not excessive) wholesome lactic acid, not natural to dry fodder, but taking the place of ripe fruits, which have been proved to be good for man or beast.

4th. Because the ensilage in the silo is partially digested, relieving the digestive organs of the animals feeding upon it, of a part of their burden, corresponding therefore in part to the cooking of the food of cattle, and for several other reasons.

I thank you for your kind and interested attention to my demonstrations, and for the hearty approval that you have so frequently expressed.

[This address, the substance of which only is here given, was enthusiastically applauded, and declared by all who heard it to be not only the treat of the evening, but of the entire session.

Dr. Lambert's new work, just published, "PHYSIOLOGY, ANATOMY and HYGIENE," about 400 pages, including 75 pages of illustrations, may be had at this office. Price, $2.00. It is a most valuable book for every person, young or old.]

HOW ENSILAGE PAYS IN ILLINOIS.

MR. J. B. BROWN. GODFREY, ILLS., February 13, 1885.

Dear Sir: I am feeding my ensilage direct from the silo. It is built on a side-hill with the cow-stable a little above the bottom of the silo. Give my cows about 25 lbs. of ensilage mixed with 2 lbs. bran in the feed-trough, morning and evening; turn them in the yard for water and dry corn fodder; at night give them 3 or 4 lbs. clover hay after eating their ensilage. The more they will eat up clean, the better I like it. I am not trying to scrimp them on feed. As a result the six cows made me 157¾ lbs. butter during the month of January; all but one were milked summer and fall, one fresh December 1. It takes 18 lbs. milk to make one gauge of cream—one pound butter; and costs me 9½ cts. for feed. I have a statement of 12 patrons of the Godfrey Creamery, and the amount it costs them for feed for one gauge of cream (they all feed dry feed)—it runs from 11 cts. to 26½ cts. per gauge, with an average of 16 4-5 cts. per gauge. Not one comes near making the amount of cream I do from the same number of cows, even when they are all fresh.

Will try your plan of mixing the feed and let it heat—see if it makes any difference in the amount of milk and cream. I have evidence enough now to prove that ensilage pays as well here as in the East.

I usually answer all inquiries; it don't hurt me, and it may do them good.

Respectfully, J. Y. SAWYER, JR.

Reports of First and Second Ensilage Congresses, 30 cents each.

HISTORY OF M. GOFFART'S INVENTION.

From his Speech at Blois, May 8, 1875.

In 1850 I made some experiments in the ensilage of wheat at Versailles, since which time the preservation of fodder has become my favorite occupation. In 1852 I constructed four underground silos, with masonry, and cemented, each having a capacity of two cubic metres; these silos I have filled and emptied several thousand times. Maize, Jerusalem artichokes, beets, sorgho, turnips, potatoes, straw, I have experimented upon with more or less success. Straw, in the scarcity of fodder, has several times saved my stables. Some years ago I had in the autumn more than 80 horned cattle, and my hay crop would not have permitted me to support 10. One should be an agriculturist of Sologne to know what such a trouble means. In rich countries when the hay crop fails, it means that instead of harvesting 5,000 or 6,000 kilogrammes to the hectare, there are only 3,000 or 4,000, but in Sologne it means that there is no crop at all. In such difficulties the enterprising cultivator must use more intelligence and more industry. "What the man is worth, that the land is worth," is an old proverb, but I will improve upon it by saying, the man should be worth more, as the land is worth less.

I got through safely that year by having 50,000 bundles of wheat, rye, and oat straw. I cut them up, and with 35 kilogrammes of rye flour, which I fermented each day in large tubs, and in which I soaked the straw, I obtained food that was softened by fermentation, which my cattle ate freely and digested easily. Thus I reached the following spring without being obliged to sell my cattle at a low price. I must acknowledge that at the end of winter my beasts were in a sorry condition, but the first grass quickly restored them, and I was not compelled to replace them at a high price in the spring;

and now, the two years of scarcity which my fellow-agriculturists have passed through have been for me—owing to my silos—years of unprecedented plenty. What I have done can be done by thousands of others, and my earnest desire, my sole ambition, is to enable them to imitate me as soon as possible. Until 1872 I only expected from my limited ensilages the means of prolonging for three weeks, or at most a month, the use of maize, so desirable a food for my cattle. To that end I made many experiments. I have mixed my cut maize with various proportions of straw, in order to find which would give the best result. I have made silos without cover, burying the ensilage under bundles of straw, then with earth (never sand). I have filled my four silos with every possible mixture, which would sooner have put me upon the road to a positive success if I had not been too easily alarmed by slight alterations on the surface, and which I caused to extend all through by too frequent examinations.

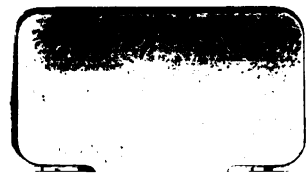
In 1873 I had a real success, due mainly to accident; and it is to be recognized that chance nearly always plays an important part in the happiest discoveries.

Until this time I had hardly believed that the preservation of green maize for a long time was possible, and I had very little confidence. I hesitated a while, and should have probably hesitated a good while longer if I had not been in a measure compelled to do something. The year 1873 had been exceptionally favorable for the culture of maize. At Burtin the crop was enormous. After having fed my cattle abundantly until October, besides having all that they could eat while green till December, I found that I had more than 170,000 kilogrammes that would be lost if I could not keep it at least till the following March. I went resolutely to work, and I have described elsewhere the means that I used and the result that I obtained. The difficulties were greater than one would believe, on account of the lack of faith of my employees. One day I had to leave my workmen for a while, but my return was sooner than they

expected. The work had ceased, of course. They were talking together, and I overheard my foreman say to the workmen, "This work that we are doing is all foolishness; M. Goffart had better throw his maize into the dung-heap at once, because that is where it will go to at last." I said nothing, but redoubled my watchfulness, knowing how little zeal I could expect from people so convinced of the uselessness of their labor.

A silo built upon the ground gives the best result during the cold season from December to March, but as the temperature rises fermentation develops rapidly. The underground silo with masonry walls is better; the temperature does not rise even in April, and at Burtin at this time (May 8) it is nearly in the same condition as at the time of ensilage, seven months ago. I would advise that the silo be sunk two metres in the ground, with masonry walls, and raised two meters above the ground. During the cold weather I would feed out the ensilage in the upper half, and reserve for the warmer months the lower half.

The experiment of an underground silo, but without facing the walls with masonry, has also given a favorable result, in the sense that the loss has only been one per cent of the whole, but such a silo soon falls down when it is empty, and consequently is much inferior to the former. There is another method, the simplicity of which is a dangerous temptation to the inexperienced. That is to pile the cut maize upon the soil, and to cover it with a layer of earth. I can assert that such a silo has never given good results. The packing down, which is essential to good preservation, cannot be applied to such a silo. Those who recommend this method of ensilage manifest a culpable ignorance, and cause great loss to those who follow their advice. When one loses half his capital in an operation, he is not successful; he makes a disastrous speculation. I proscribe this method in the most positive manner.

I once buried, for experiment, a thousand kilogrammes of corn-stalks, uncut, under a stack of straw, forming a layer 25 centimetres thick. In eight days it went to the dung-heap.

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